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The
Human Context for Science and Technology

An edited volume of proceedings arising out of a preliminary evaluation of strategic research needs in the human context in science and technology field, conducted in 1979



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Human Context for Science and Technology

An edited volume of proceedings arising out of a preliminary evaluation of strategic research needs in the human context in science and technology field, conducted in 1979



Directed by: C.A. Hooker

Edited by: Ted Schrecker
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Foreword

The Social Sciences and Humanities Research Council is pleased to present these working papers for the use of participants in its Strategic Grants regional workshops during 1980-81 and for other interested readers.

Views expressed in these papers are those of the authors, and distribution by the Council does not imply endorsement.

On behalf of the Council I should like to extend my best wishes for profitable and fruitful discussion in the months ahead.

André Fortier
President

May 1980

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ABOUT THIS VOLUME

The papers contained in this volume are, with one exception, revised and edited versions of papers written for a symposium on the Human context for Science and Technology at the University of Western Ontario, London, Ontario, November 16-19, 1979. The volume also includes a selection from comments which were solicited on the papers received for the symposium. Further details on the structure and purpose of the symposium, which was sponsored by the Social Sciences and Humanities Research Council of Canada as the first step in a process of evaluating priorities for strategic funding, are to be found in the "Preliminary Report" to the Council by C.A. Hooker in this volume. Volumes II and III of the original report to Council contained the original papers and comments and is available at Council.

The one exception is the paper on "The Implications of Philosophy of Science for Science Policy", by A.K. Bjerring and C.A. Hooker. It was not among those presented at the symposium, but was distributed with the final report and has been included here as additional theoretical background. Additionally, the paper "The Resolution of Social Problems of Scientific Origin: Issues in Science and Law", by Howard Eddy and Jack Basuk, was originally appended to the paper by Judith Miller. It has not been included here, but is available from the Science Council of Canada.

This volume has tried to perform two functions: first, to provide a schematic representation (not a precise historical record) of the range and complexity of issues which arose at the November symposium and, second, to illustrate for those with an interest in the human context of science and technology the richness of the field.

In this context, a word is in order about the "Comments" in this volume. These are just a selection of the comments received on the papers prepared for the symposium. We have been asked to have this volume ready for use as background material for the first set of meetings in the second round of discussions on strategic research opportunities in the field. As a result, unfortunately, there has not been the time available to first provide commentators with the revised versions of papers to which they make reference. We have attempted instead to focus on those points of independent value in the comments and in any case have made every effort to ensure that references made by commentators to specific papers are still accurate and in context. Any incongruities which the reader may notice are therefore the responsibility of the editor rather than of the commentators.

Our sincere thanks go out to all those people who contributed to this volume, and who so willingly undertook substantial revision of their contributions on very short notice to make this finished product possible.

London, Ontario
April 14, 1980.

C.A. Hooker
Ted Schrecker

Acknowledgement

Ted Schrecker was engaged to bear the brunt of editing this volume while I was engaged developing the basis for 1980's activities in the field. He has performed the task with diligence, excellent judgement and faultless organization, thereby making my role the easy one of "consultant". I am very grateful for his efforts.

C.A. Hooker

THE HUMAN CONTEXT FOR SCIENCE AND TECHNOLOGY

Preliminary Report

Prepared for: Social Sciences and Humanities Research
Council, Strategic Grants Programme

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Date: 27th November, 1979

THE HUMAN CONTEXT FOR SCIENCE AND TECHNOLOGY: A PRELIMINARY REPORT

Acknowledgements

My primary debt is to Terry Burrell, research associate for the project. Without his able assistance this project could not have been viably managed, participation would not have been as well balanced and this report would have been much less sharply focussed.

I am also deeply indebted to Ms Penny Lister and Mrs. Bev Hughes who successively took on the harrowing task of coping with normal secretarial duties while acting as administrator to this project. Each carried out the task flawlessly, cheerfully and with initiative and dedication. Many hours were saved by their forethought; weekend hours were dedicated to meeting deadlines. I am deeply grateful to them both.

I owe Mrs. Maxine Abrams, Department administrator, much thanks for help with financial administration of the project, which she coped with in the same flawless, cheerful style, all the while fending off an horrendous mountain of paper and a confused computer - and for emergency typing.

Finally I record my debt to, and admiration for, all those participants who carved out of already busy lives the time and energy to produce background papers and reviews and who threw themselves into a long and demanding exchange of views, so that this evaluation process might have some depth and quality.

The Project

The Social Sciences and Humanities Research Council has decided to initiate activities in the field of strategic or directed funding. As part of a preliminary inquiry into research priorities it has selected four areas of concern in which it has determined it will ask the research community for guidance in respect of research needs and priorities. One of these areas is the Human Context for Science and Technology - hereafter HCST.¹

The approach chosen was to ask the author (CAH) to prepare a programme for the assessment of research priorities in this area, including preparation of background papers together with some form of meeting, involving principally the relevant Canadian research community. The request was made in mid-July, 1979, with a deadline of November 30, 1979. Consequently, the objective of this report is to explore the motivation for supporting research in the HCST field and to explore research themes within the field, in a specifically Canadian context.

Given the constraints imposed by time and Council's other requirements, the following process was adopted:

- I. Twenty background papers were commissioned dealing with various aspects of the field - to be completed by October 20, 1979.² A tentative suggestive framework for these papers was provided by a discussion note by the author (CAH) circulated in September, 1979, and reproduced here as Annex 1.
- II. A seminar on research themes and priorities in the HCST field, utilising the background papers, was held November 16-19, 1979. Some eighteen people were invited to attend in addition to all those preparing background papers.³
- III. Simultaneously with the seminar, written comments on the background papers and the HCST field generally were solicited from a wide range of people, to be available by November 16, 1979.⁴
- IV. On the basis of inputs I, II and III this report was prepared for Council.
- V. The report itself consists of four parts, of which Part I is the preface, devoted to the practical setting in which the report was drawn up. Part II provides a 'snapshot' of the field and introduces the historical setting for the emergence of the field, leading into a discussion of the motives for working in it and for supporting it. Part III discusses the nature of the field in more detail and surveys the themes and issues which arose during the evaluation process. Part IV

discusses questions of institutional structures to permit research to develop and to support research in the field, and is followed by a brief conclusion.

Considerable efforts were made to contact a representative group in the relevant research community. In particular, an attempt was made to move outside the university and civil service based research systems to contact those in a wider community. These efforts are reflected to some extent in the participants in Parts II and III of the process.⁵ However, constraints on time (dominant among other constraints) imposed real limitations on the success of these efforts, from both sides.

Limitations

The process and the report have a special significance given to them by their historical setting. It is rare for government research agencies to consult their research constituencies in so open a format. The process creates an important and happy precedent. Moreover, this present process is, to our knowledge, the first time there has been any public attempt in Canada to bring practitioners together from what is a rapidly expanding and socially very involved field. It is deeply to be hoped that the present process is but the initial step which will serve to stimulate an on-going discussion throughout the research community, one that will help to form a sense of community where there has been little and to crystallise awareness and expertise around issues of vital importance to the larger Canadian community. In this setting, it is important that the limitations of the report be kept clearly in mind.

Unfortunately, commensurate with the potential importance of the process are the constraints under which it was carried out. The financial constraints were real enough, but in the circumstances the limited time available with which to undertake the process was the most important constraint of all. In effect, only four months was provided to initiate the process and carry out the evaluation and this period spanned both the summer holiday period and the winter commencement of academic and bureaucratic activities. In consequence, the study fell short of the richness and depth which it might have had, and properly should have had, had there been something approaching thrice the time in which to carry it out. Some of the ablest people approached could not join the process because of time limitations (for example, Bruce Doern, Derrick Sewell, David Suzuki), while several others who initially agreed to participate found the pressure of time in the process too much to cope with and were ultimately forced to withdraw. Nearly everyone else involved in the process expressed some form of reservation about the time restraints, but because of their estimation of the importance of the process and their commitment to the field managed to set aside at least some proportion of the time required to do a thoughtful job. In many cases this amounted to levels of effort which can only be described as "well above and beyond the call of duty", for which we all are thankful.

Time restraints also meant that there was a limited opportunity to conduct a careful inquiry within the Canadian community in order to be sure of involving all of the really active and creative contributors to the field. Within the research community as such we recognise that not all groups that have interests in the HCST field are appropriately represented. Substantial efforts were made, for example, to involve practitioners of the history and sociology of science, largely without success.⁶ Absent, too, are people concerned with the economic analysis of decision making, both in public policy areas and in the practice of science itself, and philosophers of science and technology concerned with the basic nature of the processes and their bearing on the human context in which they occur.⁷ Cultural historians and those concerned with the impact of technology on culture (and vice versa) are also clearly involved in the field, but were not involved in this process. Finally, there are many identifiable non-academic institutions and groups whose (selective) representation might well have enhanced balance and insight.⁸ Further development of the field would be greatly enhanced through a less confined process which could involve a wider range of these people.

Moreover, a weekend seminar and one round of written responses to background papers is too brief an assessment process to allow the diversity of approaches expressed either to be unified or to crystallise into clear, systematic alternatives. There needs to be a more extended process of interaction within the concerned community, research and otherwise, for this to occur in a satisfactory manner.

These last considerations become important in the context of a final limitation imposed by the institutional setting: "strategic" funding implies a goal, achieving some kind of objective - however, at this point in time we are somewhat in the position of discussing goal oriented research without a clear goal having been delineated. Part II moves a little distance toward offering analysis of need, but basically the ultimate objectives of the process remain undefined as yet. Moreover, as several writers have stressed (e.g. Miller, Mowshowitz, Sutherland - see Appendix A), the relations between the products of research and various kinds of social action remain unclear and unresolved. Thus the impacted people (who are properly involved in the setting of goals) remain equally unclear at this stage.

Consequently, the report does not attempt to outline a specific programme with clear and consistent internal priorities. At present, there are different potential objectives that might be held. For example, a plausible objective might be to develop a distinctly *Canadian* capability in this area, focusing on topics or areas which have a *distinctly* Canadian character, areas that would benefit from further work to strengthen them. Another plausible goal would be to address those questions/issues which appear to be of great interest and import to Canadian society at this time. This latter goal could lead to very different criteria of support, and likely support researchers in somewhat different institutional roles, than would the former goals. Yet a third goal might be to strengthen Canadian research capability in the HCST area, wherever interests lie.⁹ The issue of choice of goals is raised again in Part IV.

II. THE IMPORTANCE OF THE HCST FIELD

Over the past four decades two easily identifiable broad concerns have emerged, each much intensified in the 1970's. The first concern is with the problems faced by modern society, problems perceived to have their roots in the social deployment of modern science and technology. The other concern is with the growing social, especially governmental, involvement of science and technology with 'Big Science' as a societal commitment with important ramifications. These concerns do not exhaust the HCST field but they are typical of it, and I briefly explore some of the issues they raise before proceeding to a more systematic discussion of the historical setting.

Some of the current issues which focus the first concern with problems are:

- Concern for workplace safety specifically and for the "diseases of modern society" generally (cancer, heart failure, lung failure).
- Concern for the future of natural ecosystems and biological stability generally on the planet.
- Concern with radically new kinds of decisions science and technology are thrusting upon us, e.g. radiation damage management over millenia, cloning and personal identity, hydrocarbon consumption and world climate management.
- Broad concerns with the 'limits' to Western industrial development patterns.
- Concern with the pace of technological development, with 'future shock' and 'information overload'.
- Concern with the overall nature of technology or technique, its general psychological and cultural impacts as well as its economic and bio-physical impacts.

The second concern, with the social institutionalisation of science, is focused in the following issues, among others:

- Concern to provide a descriptive history of the social institutionalisation of science and its observable impacts on the practice of science and technology.
- Concern to relate the practice of science and technology to the national interest; where should it be heading (if anywhere other than toward the truth)? What should be supported and how best to support it?

- Concern to establish the moral and social limits (if any) to scientific investigation, and to explore societally-based structuring of research and development priorities (e.g. nuclear versus solar energy).
- Concern to relate the societal support of science and technology to the support of individual development; science for whom now? For whom ideally? How to make science and technology equitably accessible?

The HCST field of studies is driven on the one hand by an awareness of the central importance of science and technology in modern life and on the other hand by an awareness of the growing urgency and scale of contemporary societal problems. Life and its problems come as they are, not in disciplines. Thus it is that the HCST field is more akin to criminology than to psychology.

Psychology, we shall assume for the purposes of this illustration, is a discipline *sui generis*, a fundamental field of theoretical inquiry in its own right. Criminology, by contrast, is defined by its *interests*, not by its disciplinary subject matter. Criminologists borrow from (i.e. apply) many different basic disciplines in the *interests* of creating a group of applied theories, techniques and technologies which are *valuable* for understanding and managing the *socially defined* field of criminal behaviour. The italicised words mark the difference in orientation from 'pure' disciplinary research.

Similarly, our understanding of the HCST field is that it is an area of activity created by an interest in the interface between the practices of science and technology on the one side and the larger human (social) context of which those practices are a part and which they affect, on the other. Practitioners in this field borrow from a wide range of basic disciplines in the interest of developing a body of applied theory, techniques and technologies which are valuable for understanding and managing the socially defined field of the practices of science and technology.¹⁰

The nature of the field should not lead one to see it as of secondary importance. Quite aside from the social importance of the problems which it addresses, it has been a fact that the development of just such fields has served as a major source of fertilisation for the basic disciplines themselves. The HCST field is no exception; for example, much work in the foundations of ethics and economics today is generated by problems which are focused upon in the HCST area (see further below).

In practice then we expect to find a wide range of specific research interests in the field depending on the interests of the researcher and, often, on the interests of those to whom the research is directed. Some of the issues important to the field have already been sketched at the beginning of this discussion.¹¹ But before proceeding to a more extended discussion of issues in the field, it is worthwhile to step back and take a more careful and systematic look at the historical circumstances in which the field has emerged.

We live in an age of increasingly large-scale and intractable problems. Knelman, for example, identifies four of them: (i) energy/resources, (ii) equity/distribution, (iii) environment, and (iv) population. Canadians must be as aware as any people on earth that the industrial world is galloping towards the exhaustion of its conventional energy resources. And Canadians, too, must share the doubtful privilege of having as vivid an experience as any nation in recent historical times of the real limits of their apparently limitless forest resources. The record of polluted and disrupted ecological systems can be read almost daily from Canadian newspapers. The list of endangered species grows apace. The human toll in disrupted lifestyles (e.g. for Indian peoples banned from fishing), unemployment (e.g. commercial fishermen banned from Lake St. Clair), disability (e.g. silicosis) and death (e.g. around 80-90% of all cancers are now thought to be induced by human alterations of the environment) is mounting equally rapidly.

We need to add to Knelman's four dilemmas a fifth: the increasingly massive and intensive proliferation of military weaponry, especially nuclear weapons, of increasing technological sophistication, and their deployment throughout the world.

These are essentially "Malthusian dilemmas", i.e. they are phenomena of relatively uncontrolled growth running up against real limits built into the structure of life. It is this sense of limits which Jackson stresses, bringing the situation home to Canada with a discussion of the limits to energy supply, forests, lakes, wastes and natural environment. Jackson then goes on to include other limits which are making themselves felt in our present circumstances. There are economic limits, made visible in various paradoxes; e.g. suffering simultaneously from unemployment, inflation and diminishing returns on capital; having an increasing gross national product but a decreasing quality of life. There are also social limits, made visible, e.g. in the increasing gulf between sophisticated managerial working roles and low-skilled working roles; in the increasing costs (in time, medical health, richness of social experience, etc.) of the increasing specialisation and extendedness of the urban system; in the increasing contrast between the pace and rate of change of social and work roles and the private human need for stability and relaxation. There are institutional/governmental limits, made evident, for example, in the rapidly expanding size of government bureaucracies; in the expanding gulf between the day-to-day management of crises, with which the top echelons of government seem to be increasingly absorbed, and the attempt to develop public policy in a more rational, larger framework; in the increasing disparities between the information required and that available, between the costs incurred to obtain information and the effectiveness with which it can actually be used in bureaucratic decision making processes.

We have become increasingly self-conscious of the development of our problem setting and this consciousness leads to the injection of new values into the public policy making setting. Thus we have in recent times witnessed a conscious valuing of natural environment, of resource conservation, of alternative life styles, and, on a global level, humans have become increasingly conscious of the larger issues which affect the development and balance of mankind on the planet as a whole.

The development of science and technology has, of course, also made possible all those features of the contemporary setting which would be counted as beneficial, or as having beneficial as well as detrimental features, from antibiotics to jet travel, from telephones to plastics.

In this setting there has been a growing conscious awareness that the development of science and technology has been responsible for making it possible for humans to create these problems, and the benefits; and awareness that it has allowed us to press against our limits in the pursuit of benefit. This awareness has led to a new and uniquely intense focus upon science and technology as intellectual structures and upon the human activities which to go make them up.

It is this emerging historical awareness of the uniquely important role of science and technology in the human situation which forms the setting for the present evaluative process. It provides the most basic reason for holding that *research in the HCST field must be among the most important and urgent priorities.*

I have thus far concentrated on recalling the uniqueness of our historical circumstances in respect of the problems we face, largely because of the expansion of our matter-energy systems. But I have already had cause to note (i) that it was the development of an information and decision making system(s) - those of the scientific and technological processes in our society - which made possible the expansion of matter-energy systems; and (ii) that in addition to the sheerly negative impact of these expansions, humans are also beginning to run up against quite subtle limits of an individual, social and institutional/governmental nature which has to do with their capacity for information processing and decision making. The two processes are connected historically, each has stimulated the other. Moreover, each has made dealing with the other more difficult. Let us pause then to note that in these respects we have moved ourselves into an unprecedented historical situation:

First, we are at an historical watershed with respect to the human and social ramifications of our science-based public policies. Never before have human technological and social actions reached significantly planetary or global thresholds. For the first time we can contemplate conceiving a technology, creating it and applying it to a large part of the planet within a single generation or perhaps a couple of generations. Never before have our technological and social policies had such wide-ranging or long term ramifications. For the first time investments of technology, capital, education and other social resources in social and techno-scientific policies approach the point where these policies commit human societies to courses of development across the globe and for a generation or more into the future. Never before have human social and techno-scientific policies threatened to exceed the biological constraints on human management capacity.

Consequently, there is an urgent historical need (i) for adequate intellectual tools to handle the assessment and management of our public, science and technology based actions; (ii) for adequate insitutional structures to choose wisely the political and social assessment and management of policy choices; and (iii) for adequate theories and institutions for controlling or managing the

societal consequences of deploying the resulting techniques and technologies.

Second, this demand has occurred in a particular historical context: never before has the conduct of intellectual enquiry and the development of intellectual tools been so crucially dependent upon the social institutionalisation of the processes of enquiry and technological development. (And that in a setting where the 'official' theories of science only obscure the issues.) Never before has there been such an intimate degree of interaction between the operation of such institutional structures and the broad distribution of social resources toward their support. We are then, also at an historical watershed in the social character of intellectual, and especially of scientific, activity. And the creation by science of theories and technologies of social control and management has only served to intensify the interdependency between science/technology and society. The demand for tools of policy assessment and policy management has already been noted; to this can be added the rapid spread of applied scientific theories in such public areas as transportation and urban planning, economic policy, regional and social development, military strategy, etc., etc.

Third, the control and management theories emerging from the challenge of the first watershed are, because of the second watershed, now turned back on the control/management of science and technology itself, to create a uniquely complex and intensely self-reflexive situation. The necessity of facing up to the control of our complex systems has forced the emergence of a consciousness of design which is unique to this century. The past half century has seen the emergence of systems theory, decision theory and the host of their sub-disciplines (including indicator/assessment/policy theories) as well as a growing consciousness of the potential limits of our own models of cognitive control. We are a species which is capable not only of adapting its environment, on a large scale, employing external energy subsidies - all things which other species do also. We are in addition capable of grasping self-consciously the design of our own society and environment, critically debating the merits of alternative designs, and possessing (at least some) means of effecting desired design changes. This development offers us a sorely needed tool for survival. Coming at a time when the quality of our lives, perhaps even our existence, is threatened by our unthinking expansion of our relatively newly acquired matter-energy/information systems, it constitutes the true and secret significance of the twentieth century.

In sum, scientists and technologists are in a unique historical situation: they make possible in an unprecedented way the changes (good and bad) which are occurring around us, their activities are now uniquely interdependent with those of the society at large which is the experiencing subject of change, and the understanding and management of change is uniquely dependent upon the development of complex theories and tools within the domain of science and technology itself. *It is out of this conjunction of historical processes that the particular importance and complexity of the HCST field arises.*

As a final remark on the setting of the process we note that because of the issues raised it cannot be expected that research in the science/technology area will be self contained. To the contrary, what is at stake is nothing less than the future of human beings on the planet, the future development of science and technology itself, the future qualities of life which human beings will experience. Indeed, ultimately the fundamental social and biological conceptions of what it is to be a person are affected. Thus there must be brought into play the profoundest sources of intelligence and wisdom concerning our own nature and that of the cosmos in which we live. This, at bottom, is what accounts for the prominence of human values/human choice considerations in the field.

There is a widely perceived importance to insuring greater control over the direction of our social development by submitting the products of our science and technology to more conscious, deliberate and informed choice. But we currently know very little about central aspects of the science/technology ↔ society interface. And much of what we do know is socially selective; it is partial and tends to favour the interests of some groups over others (e.g. groups promoting technology development over groups impacted by these developments). Consequently a dramatic improvement is called for in our understanding of the key issues. This will involve an examination of the social implications of both the deployment and use of specific technologies (and technology in general) and the (institutionalised) practice of science and technology development. A balanced approach necessitates an examination of both of these from a number of different perspectives (e.g. to overcome inequities of access to information). Researchers may contribute to this task through a primary concern with descriptive analysis, critical evaluation or development of managerial recommendations.

By its nature, much of this work cuts across academic disciplines, an activity that has rarely been encouraged. There are, however, knowledgeable people in Canada currently undertaking work in this area. They need to be supported in this and their work and their numbers need to be appropriately expanded.

The Council has a special role to play in supporting these activities. Council's mandate covers research support in the humanities and social sciences; in this it is unique in the Canadian context. HCST is an area of considerable social importance in which Canadian research capability exists that especially requires the integrated presence of the full panoply of human and social concerns. It is thus a field well deserving of HCST support, one of which corresponds to Council's mandated responsibilities. Other countries fund strong programmes in the same field or closely related fields (e.g. the U.S. Ethics and Human Values in Science and Technology Programme). In the Canadian setting, if Council does not support this field, it is not likely to attract funds from elsewhere.¹²

III. THE HCST FIELD: SOME PRELIMINARY CHARACTERISATIONS

As remarked earlier, the HCST field is the focus of a number of interests in the interface between the practice of science and technology and the larger human, especially social, context in which those practices occur. One characterisation of the field has already been offered, namely as a field of related interests held together by a common perception (the pervasive importance of science and technology to contemporary life) and a common concern (to respond to contemporary science/technology-generated problems). This leads to one way of locating interests in the field.

There are two natural, complementary responses to a problem, to want to understand it and to want to resolve it. And even in the absence of urgent problems, there are the desires to understand, and to anticipate and prevent problems. There are two poles of concern, then, which hold practitioners between them, understanding and action. There is another dimension which locates a dominant kind of orientation which a researcher brings to the field, an interest in normative theories, methods and activity orientations as contrasted to an interest in empirical theories, methods and activity orientations. Some researchers bring normative philosophical theories of science to bear on understanding the development of science as such. They might be viewed as combining understanding and normative orientations. Some researchers, on the other hand, employ empirical studies of sciencepolicy with the intention of recommending more effective actions to policy makers. They might be described as combining action and empirical orientations. Obviously there are action-oriented normative studies (e.g. normative theory of technology assessment) and understanding-oriented empirical studies (e.g. history of cultural impacts of science) as well.

These are not the only way to view participants' interests. Another useful division is between a focus on general theoretical concerns (e.g. theory of science, or technology; theory of applied ethics), a focus on specific technologies, covering all dimensions (e.g. on values/social consequences of energy policy) and a focus on managerial responses to science and technologies (e.g. science policy studies, technology assessment, etc.). Yet another perspective might be provided by grouping researchers according to their interests in social change (e.g. change within science/technology), in the social institutionalisation of those activities, in the changing managerial/administrative responses to the former and in society at large, as induced by science and technology.

The HCST field is (unhappily) nearly unique in its desire *not* to separate theory and practice. Thus, as remarked, it is typical for participants' real interests to cover several combinations of orientations among the foregoing. Tester, e.g. begins with a fundamental critique of technology assessment theory, but with an eye to designing more acceptable assessment procedures. Brusegard begins by exploring the idea of a theory of social indicators, but uses it to emphasise the importance of the processes of developing and using social indicators. Guédon deploys a theoretical critique of normative theories of science to suggest new processes for distributing scientific research effort.

And of course the connections also flow the other way; many of the ethical/social issues in computing were not clearly focussed until the technology had been widely implemented (cf. Mowshowitz). The Berger Royal Commission's efforts to assess proposed northern energy developments (among other activities) focussed attention on the need for an underlying theory of assessment processes and of inter-cultural judgements (Tester) and so on. It is this kind of interaction, expressing the complexity of the reality addressed, which also helps to hold the field together - and which defeats those who would make just another "discipline" out of it.

Consider, by way of an example actually explored at the November seminar, the issues which cluster around the decision to drill for oil in the Beaufort Sea. The immediate question is "Was the decision justified, should we drill for oil there?" The immediate answer which suggests itself is that the drilling is justified by an elementary cost/benefit calculation: the value of the oil is greater than the cost to obtain it. But of course people have become increasingly resistant to accepting such replies without digging deeper into the issue. How do you value oil, especially when its price is clearly a matter of political decision? Is the oil needed at all? Why? How are such consequences as environmental/life-style disruption valued? How do risks enter the equation? And so on. I shall, then, back up for a moment to take a more systematic look at the important questions.

First, there is the historical policy setting, the suddenly urgent desire to locate new oil supplies. This raises questions as to the "need" for oil, focussing initially around thermodynamic efficiency but soon seen to be intimately bound to urban transportation and building patterns, rural use of machines/fertilisers, etc., and so ultimately bound to lifestyles and political choice processes. It also raises historical and cultural questions as to the development of the problem, its earlier perception, the reasons for the suddenness of its urgency. And it raises scientific and political questions as to the generation of reserves data, and the appropriateness of government dependency on data supplied by interested parties.

Second, there is the question of just distribution of the wealth generated by national resources, both between private and public interests and between different regions of the country. There is also the question of foreign versus national, and private versus public, ownership of resource companies, both as economic and as social-political issues. And this, in conjunction with considerations of "need", raises questions concerning the Canadian industrial infrastructure and social control of the Canadian economy.

Third, there are socio-environmental issues; disruption of traditional lifestyles (likely their eventual demise), potential disruption of Caribou migrations, threat of oil spill beneath the ice, and so on. Beyond this there is a possibility that environmental accidents might alter global climatic balances, with disastrous consequences for many more than will risk their lives to obtain the oil, or than will be disrupted in the obtaining of it, or than will consume it to their benefit.

Fourth, there arises the issue of energy sources and technologies alternative to oil, the conditions of their research, development and deployment, the assessment of their characteristics in all respects so far mentioned and the process of public choice among them.

Fifth, and finally, there are the costs and benefits of all sorts which thus accrue to future generations from chosen energy activities.

These are not all the dimensions to the decision. However this brief sketch suffices to indicate some of the important dimensions to the issue. It serves to highlight the deep involvement of normative considerations of many sorts, e.g. justice and equity, legitimate social control, responsibility to non-participants, choice under risk and uncertainty, needs versus wants, rights for other cultures and for natural objects, and so on.

Also raised are important social, political and cultural questions. One issue is that of the proper role of native peoples and cultures in Canadian society. Among many strands, mention is made only of the historical understanding of native and western cultural adaptations to the Canadian environment and its potential lessons for modern industrial culture. Other issues concern divisions of powers, regional disparity and national unity, the impact of international capitalism on Canadian economic structure, and so on. All of these issues also serve to provide so many demands to develop assessment and monitoring (indicator) methods and data to inform public choice processes.

There are questions raised concerning scientific and technological development and deployment and the control of these processes. Thus, e.g., new technologies were required for drilling in sub-zero temperatures, for transporting oil across permafrost, etc. and new developments in engineering and geological sciences to guide these. The safety, environmental benignness and industrial spin-offs of these developments require assessment. With respect to alternative technologies and the apparent difficulty of developing these, there are questions raised on the one hand about the theory and practice of technological "innovation in a cold climate" (cf. Science Council of Canada) and on the other hand about scientific and technological innovation in a quasi-underdeveloped, or "branchplant" economy (cf. Grey Royal Commission, Science Council of Canada, etc.) The connection of oil spills to climatic balance necessitates urgent attention to improved global climate theories as well as to assessment and monitoring processes. And beyond the immediate issues there are the subtler effects, e.g. on educational institutions and educational biases, of having an employment boom in these sciences with relative stagnation in the remainder - and, within the former sciences, of rapidly expanding activity in the specifically involved theoretical areas with relatively less interest in the remainder.

Many of these issues of course go well beyond the confines of what might reasonably be viewed as the HCST field, which is specifically concerned with their social and evaluative dimensions, but that is both inevitable, and to the good. (Interaction enriches.) Many individual basic disciplines are

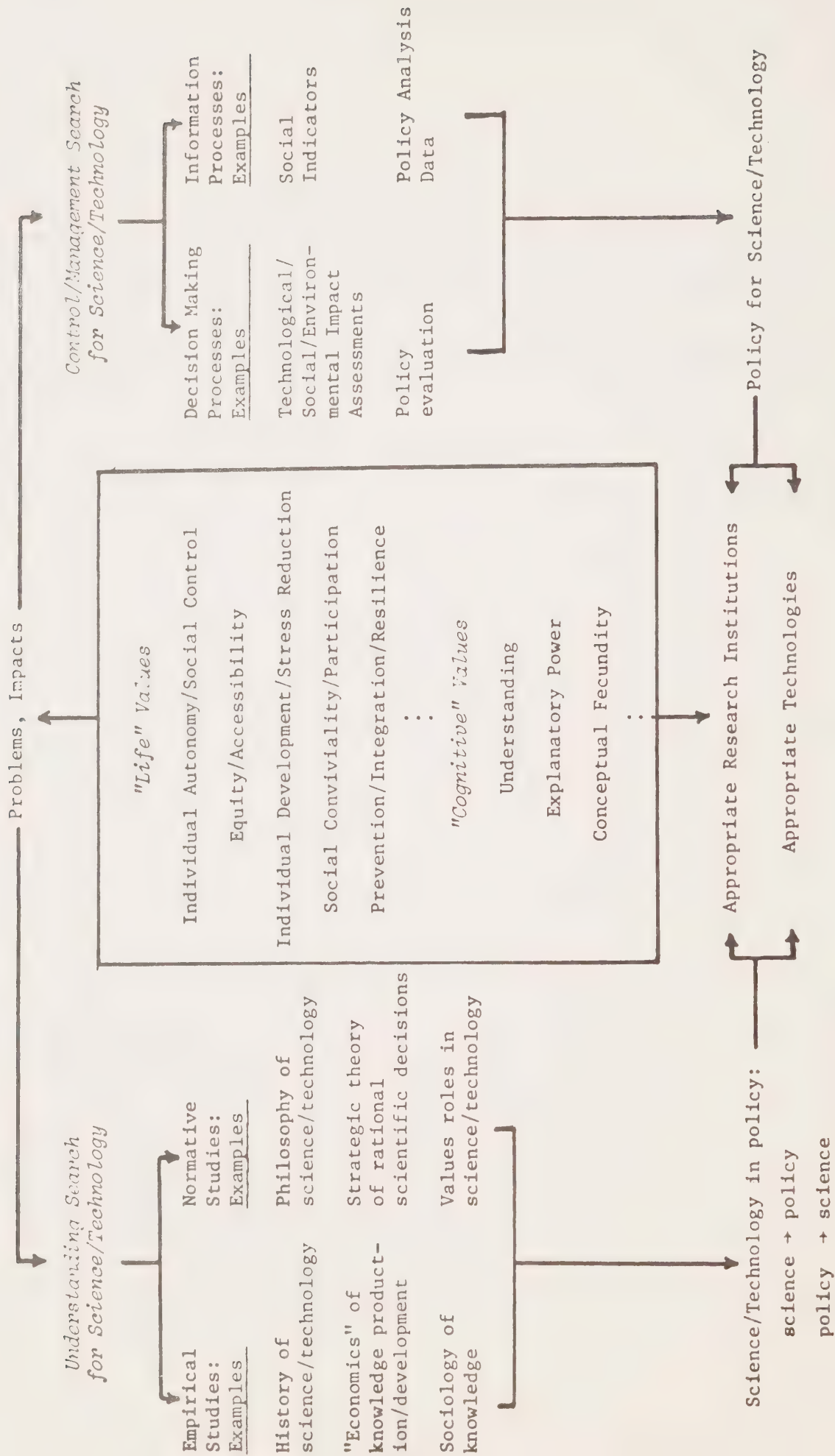
of course also legitimately involved, but this is to be expected and does not alter the necessity of integrated study. For what is in evidence here is that combination of normative, cultural, historical, social and political factors, and the intimate supra-disciplinary interaction among them, that is characteristic of the problems that form one primary motivation for the field. It makes their integrated study a uniquely Council responsibility, and a privilege.

One could have picked instead on many alternative current Canadian issues, from foetal monitoring (Hoffmaster) to micro chip processors (Mowshowitz, Martin, Valaskakis), from policy evaluation techniques (Sutherland) to technology assessment (Demirdache), and been able to exhibit the same richness of questions and aspects, the same necessity for integrated investigation.

Lest there be misunderstanding, let me remind that this problem-centred case has been by way of example of what motivates the research from that side; it is not to deny the importance of curiosity-motivated or anticipation-motivated research. Nor is it to downplay those more restricted studies still unique to the HCST rather than to field basic disciplines, intense pursuit of which is essential to provide a foundation on which to approach larger problems. For example, history of the impacts of science and technology on cultural images of persons, values and social structures and vice versa is one of these latter pursuits, often curiosity-motivated; it is nonetheless essential to developing useful theories of the science/technology-human society interface. Moreover, it provides an important frame of reference for action-oriented theories such as technology assessment and, often, for specific assessments (e.g. those of the Berger Royal Commission). This is not to emphasise history at the expense of other studies; historical studies were but the example chosen. It is to emphasise *the importance of maintaining the diversity of activities in the field, as well as a sense of its larger interactive cohesion.*

With this discussion in mind, some of the main themes emerging from the papers and seminar discussions may be set out in the accompanying diagram. Again, this diagram is intended to orient the reader to the field, it is not intended as a definition of it. Moreover, it is a partial representation, both omitting or hiding some interests (e.g. cultural and historical components) and unequally emphasising others (e.g. placing assessments as 'prior to' institutional re-design in the diagram flow).

The diagram represents several of the fundamental tensions animating the field: (1) the tension between understanding and action, (2) the tension between a narrower intense research focus and inter-disciplinary integration, (3) the tension between empirical investigation and normative investigation. Lying beneath these tensions is the tension within the researcher between the critical agnosticism appropriate to research and the commitment appropriate to being a person. *It is crucial to the recognition of the uniqueness of this field that these tensions be recognised as among its central animating features.*



Tensions can be fruitful only if they are kept in balance. Some researchers may temporarily resolve these tensions by concentrating on some specific research (e.g. on empirical sociology of Canadian research) or through involvement in some specific action (e.g. conducting an impact assessment), but ultimately they must be driven back to the larger context if their work is to remain relevant and informed, and if they are to remain whole persons. *Thus it is important that a balance be maintained among research interests, and equally important that the larger interaction and integration of these activities be fostered.*

The diagram provides a convenient way to organise several of the important themes which emerged during the process. I have chosen six of them to comment on here.

(1) Human values, aspirations, concerns, interest - whatever language one prefers to use¹³ - underlie the field. From which follows the first theme: the importance of providing fundamental, evaluative critiques of the practice of science and technology.

Whatever their other differences, people agreed that part of the reason for contemporary societal problems stems from a myth of the value neutrality of technology (and for some, of science as well) with the consequent absence of societal processes for discussing the human impact of technologies and for choosing technologies and technological designs. From which follows also the importance of articulating and clarifying the values of Canadians surrounding science and technology.

(2) Values uninformed are blind; thus the second theme complements the first by emphasising the importance of studying the domain of science and technology as a human activity, especially as a strategic and social activity. Understanding involves developing both normative and empirical theory and bringing them into interaction with one another, e.g. bringing a normative decision-theoretic model of scientific choice to confront both historical studies of scientific decisions and contemporary studies of the social organisation and motivational patterns of scientists, or bringing a managerial model of technological innovation/development to confront historical case studies and contemporary studies of pure-applied linkages. Without informative theories in these areas there is no systematic basis for action.

(3) The third theme focuses on the need to evolve a deeper understanding of the loci at which, and the mechanisms by which, science and technology enter the larger society effecting social change. Why did we find it so hard to predict in advance the multiple revolutions now being produced by the micro-electronics industry. Why is it still so hard to pinpoint the societal impacts of the next generation of multi-component silicone chips? Mere ignorance? Mere complexity? Or a superficial grasp of underlying structures and processes? Conversely, we are in equally urgent need of deeper understanding of the precise structures and processes through which society helps to

shape science. If science once "did girt fo'ard on the back of a powder cart", does it now? Must it still? What of mass consumerism, the energy crisis and urban mindscapes as shaping influences on science?

(4) Among the myriad interactions between science/technology and society one group seems deserving of special attention: the use of scientifically/technologically generated information as input to public policy processes (including public policies for science and technology themselves) and conversely, the impacts of public policies, especially science policy, on science/technology. There is an urgent need to know what scientific/technological information is available (e.g. what social statistics), where it is in fact used (if at all) and with what effect. There is an equally urgent need to consider what information should be made available and to whom and for what purposes. Conversely, public policies toward science often have counter-intuitive and counter-productive results; there is an urgent need to know a great deal more about the public management of cognitive enterprises before governments embark on elaborate science policies. And of course there are then the equally urgent normative questions concerning the limits to public control of research and, conversely, the limits to scientific/technological research because of the public interest.

(5) If appropriate information is unavailable, new research is needed to provide it. At the present time, e.g. there seems a clear need for greater information in such areas as occupational risk and the psycho-pathologies of work roles; the cultural impact of electronic information exchanges; the social costs of present workplace/home/school divisions of time, roles and rewards; the potential values impacts of genetic pre-selection/screening, foetal surgery and like techniques; and so on. In some cases there are identifiable "target groups" which have special interests in the research but which are often denied it (e.g. unions in the first example); in other cases everyone is affected. But there may be no mechanism for focussing a demand for HCST-style research. In either case new processes for initiating and supporting research need to be implemented. If the information is available but actions are unsatisfactory then again new decision making processes need to be designed and implemented. This introduces the fifth theme, the need for research into alternative research institutions (perhaps, e.g. a publicly supported 'store front' research organisation?) or perhaps support for new research alliances (e.g. to use integrated systems - theoretic tools to approach such problems as energy wholeistically? Etc.) and the need for research into alternative decision making processes (What role for public groups in decision making after the Berger, Hartt and Porter Royal Commissions? What role should the public play in relation to technology impact assessments in public decision making? Etc.).

(6) The final theme focusses on the designs of the technologies and other research products. Hitherto, assessments (technology, environmental, social) have largely been reactive; given a technology or technique already deployed or about to be developed, what are its impacts and how can the negative ones be mitigated? The point of alternative designs for research and development processes is to be able to reflect proactive assessments back into designs that will pre-empt problems. Appropriate technologies, techniques and research

programmes are to reflect as far as possible the operation of the preventive approach, pre-empting the necessity for the curative reaction. What, e.g., is a set of energy technologies appropriate to geography, resources, international relations and to the social values of Canadians? How do we design communications technologies that will enhance autonomy and conviviality rather than dependency and isolation? What can Canada learn from, and contribute to, developing nations in respect of technological designs, and scientific research designs?

These six themes help to locate the main areas of concern in the field, though they do not exhaust all legitimate concerns and activities. Beyond them, however, lies a more encompassing concern which emerged repeatedly in the process and which deserves to be listed as a seventh theme, but for its encompassing nature. The concern is with the uncovering of hidden assumptions, biases, limitations and other human 'traps' which might lie in the very form of the enterprise itself. One form of its expression is a questioning of the limits of technique; in another form there is a questioning of the limits of rational scientific knowing itself.

A more specific form of the concern was expressed in the "side effect syndrome", the scientific habit of dividing research into narrowly confined packages with the result that problems solved in one area create new problems in others. In this case neither 'technical fixes' (natural science) nor 'technique fixes' (social science) would provide a solution, only a worse 'side effect'. It is necessary to step back and reflect on the research enterprise itself.

The necessity of being able to step back and reflect deeply on the situation was a widely held perspective and led to an important specific conclusion: whatever the importance of methods and material drawn from the natural and social sciences, the humanities area (its concern, not the collection of disciplines) has a unique role to play, providing a kind of ultimate context or envelope of human concerns, ultimate questionings and deeper-than-method reflection which the sciences in practice do not and, beyond some point, cannot raise.¹⁴

On the managerial side, the same concern found its expression in the insistence that those on the receiving end of research and technological deployment and those without narrow disciplinary axes to grind, be represented in, or involved in, the basic choice processes. Diversity beyond vested research/development interest was seen as a safeguard against unnoticed faults in conception and practice. These concerns lead to the discussion of Part IV below.

Themes are neither conceptualisations of a field nor a catalogue of acceptable research projects within it; they are foci of interest and commitment. Research projects will be discussed shortly, for the moment I want to emphasise that, though these themes provide some general guidance as to the kinds of studies which were thought to be important, they do not provide a way to attach priorities to specific projects in the field. There was considerable caution expressed about attaching priorities to projects at all in some kind of

absolute way and indeed no specific sets of priorities were proposed. A more refined set of guidelines for project choice in cases of technology-focussed projects was developed by one of the seminar discussion groups; this is reprinted as Annex 2 to this article, as an example of the kind of material tentatively discussed. What was generally agreed was that the funding focus should not be too narrow: (i) Research support should be spread across several different areas or levels of concern in the field (e.g. those shortly to be listed). (ii) A balance should be struck between the specific research projects to be discussed here and the institutional developmental processes discussed in Part IV. Both types of support should be provided. (iii) Priorities, if set at all, should be set through a widely-based, open consultative process. This latter view is discussed further in Part IV below.

Having presented a thematisation of the HCST field, I turn now to a different, issues-oriented way of looking at its current foci of concern.

What follows is a selection of projects suggested by those who attended the seminar and by those who prepared background papers. The selection is partial in two ways. First, as mentioned previously, not all of the areas in the HCST field were represented in the process. Second, only a selection of the suggestions made is presented here. The reader is left to generalise appropriately.

For purposes of organising the list of suggested projects a convenient categorisation is employed; it should not be viewed as the only legitimate way to organise the field. As the reader will note, the projects specified under the categories vary widely in their selected thematic emphasis.¹⁵

1. *THE PRACTICE OF SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENT*

1.1 *General Methodological Study*

- Historical and philosophical studies which illuminate the relationship between the scientific process, national needs and the strategic, aesthetic and ethical themata which scientists use in their work.
- Comparative studies of the social, political and historical role of science and technology: e.g. studies making comparisons between Canada and other countries (say the U.S. and Australia). National development theory could provide one organising focus for these studies.
- Examination of the relationship between scientific/technological dependency and social vitality, with special reference to Canada.

1.2 Innovation and Development Study

- A critical examination of the impact of centralisation versus regionalisation on the development of a capability for technological innovation and scientific "production".
- An evaluation of the concepts of appropriate technology and appropriate scientific research, with specific reference to identifying characteristics of the infra structures required to ensure appropriateness.
- An examination of the relationship between the patents system for new scientific techniques and new technologies, and the existing social power structure.

1.3 Policy Studies

- Examination of how the choice between the development of specific scientific research programmes and specific technologies - especially the choice between 'big' and 'small' science and technologies - is made. And, specifically, does institutional inertia in public and private sectors reduce scientific and technological variety and limit choice?
- A study of Canada's export of technology and scientific techniques: the roles of the public and private sectors; the special role of technique and technology exports in Canada's aid to the Third World, including a critical evaluation of the social, cultural and economic values embodied in these together with the implications for a reconsideration of Canadian policy.

2. TECHNOLOGY IMPACT

2.1 General Methodological Study

- Work on the theory of public policy and decision-making relating specifically to the role of technology in society, and focussing on the issue of the development, deployment and use of appropriate technology.
- An examination of different methods by which public response might be gauged regarding risk information related to the deployment of specific technologies.

- A critical examination of approaches to organising and evaluating information from the social sciences directly and indirectly relating to technology impact, so as to make that information more accessible to interested groups and individuals.
- Work directly examining the relationship between the dynamics and functions of values in society and technology development, deployment and use.
- Work evaluating the common assumptions and methodological underpinnings of technology impact assessment, social impact assessment and environmental impact assessment.
- Examination of the relations between impact assessment theories (technology, social, environmental) and social data production, e.g. social indicators.
- Explorations of the inter-relationship between the nature of technological design for production in the work place and the human value of the work place; explorations which examine such issues as: When is the social organisation of a work place unethical? What are the ethical criteria for acceptable machine designs?¹⁶

2.2 Applied Areas: Specific Technologies

2.2.1 Biomedical

- Critical, inter-disciplinary examinations of the extent to which and the manner in which the new reproductive technologies should be controlled; such studies must scrutinise the future impact that these technologies are likely to have on society and develop a theoretical framework for making normative decisions concerning which social state is acceptable/desirable.¹⁷
- Studies focussing on the key normative issues surrounding the development, deployment and use of behavioural control and modification technology (such as: "Given the ability to design human beings, what kinds of human beings ought to be produced?")¹⁸
- Studies focussing on institutional issues relating specifically to health and health care in the work place.

2.2.2 Energy

- Examination of the social, political and economic implications of centralised versus decentralised energy systems.¹⁹
- Examination of the value preferences of the major players and shareholders in the emerging energy society.²⁰

- Comprehensive assessment of the impact of new energy technologies such as solar energy and heavy oils.
- An investigation of the occupational health effects and resulting human impacts of backfilling uranium mines.²¹

2.2.3 *Computers*

- Basic research studies on computer technology with the aim of developing an integrative framework for the study of the computer-society interface; one such project would examine the impact of personal data systems and electronic monetary systems on the relationship between the individual and the political structures.²²
- Studies of the likely impact on employment and the social fabric resulting from the introduction of microcircuitry.

2.2.4 *Communications*

- Critical evaluation, from a humanities/social science perspective, of technologies such as Telidon, whose deployment is both underway and potentially widespread.
- An evaluation of the effects of communication technologies on culture, behaviour and human values (e.g. do heavy television users differ significantly in cultural, behavioural and value-specific ways, from light television users?).
- An exploration of the technological conditions conducive to achieving balance, autonomy, conviviality and freedom of expression in communications technology.
- Critical studies of the media's portrayal of particular social groups; for example an imagery and content analysis of the presentation of organised labour by the C.B.C.
- Explorations of the likely effects of increased "information" on particular aspects of the production and distribution of material goods, services, advertising, education, entertainment and interpersonal communication.²³

3. FIELD OVERVIEW

3.1 Methodological/Conceptual Study

- Exercises aimed at identifying and clarifying national values concerning appropriate scientific and technological development and use patterns for Canada.
- A description and critical evaluation of effective processes for moving towards a consensus on human values which can provide the criteria and conviction for choosing the focus, methodology and use of research in the domain of science and technology.
- Studies focussed on the conceptual (and practical) integration of the HCST field as a whole.
- Studies examining the foundations for assessing the social impact of science and technological development; one such study would involve the critical appraisal of individual and social preferences to serve as a basis for evaluating the appropriateness of particular technologies.²⁴
- Explorations of new ways to organise information (on the development and impact of science and technology) so as to render it of greater use to particular groups and individuals currently with unsatisfactory access to information.
- Examinations of different indicators of social well-being for purposes of public policy making and social decision making relating to the impact of science and technology.²⁵
- A description and critical evaluation of the production and consumption of institutionalised knowledge in the science/technology domain; one theme for possible emphasis: How do federal arrangements preclude consumption (and production) of certain kinds of knowledge?

As I have repeatedly insisted, there are many informative ways of focussing the interests in the field. A principle of organisation alternative to that just presented is to look at the level of generality at which issues are being presented. In order to heighten the appreciation of the richness of the field, I now offer a very rough grouping of the background papers according to this latter intuition, which largely (though not wholly) cross-classifies that just given. The divisions chosen are matters of convenience, the issues themselves form a continuum of increasingly concretely focussed concerns. Many other supporting authors could have been referred to; many other dimensions to these issues would assuredly have been explored more fully by Canadian authors had there been more time to tap resources.

1. FRAMEWORK CHALLENGES

Understanding (intellectus) is not necessarily reducible to reason (ratio, reckoning). The reduction is much less obvious still in less narrowly cognitive areas, e.g. emotional integration, spiritual development.

But approaches to the self and relations with other selves and with the larger world are the foundation for approaches to social and political structure/functioning. In our present problem-ridden historical context it is no accident that a variety of philosophies offering an alternative society based on an alternative conception of the self (e.g. Buddhism, N'Amerind religions) have received renewed attention. These approaches also provide their own diagnoses of the errors of our present culture, in particular of the limitations of the scientific approach to problems.

Such challenges may take the form of querying the domination of value by technique and the foundation of technical rationality, querying the foundation for claiming to be able to develop technical tools to evaluate public policies (Sutherland) and challenging the value-neutrality, in particular the political neutrality, of any enterprise, including the studies of values and the sciences themselves (Guédon).

The humanities generally represent the western repository of approaches of this sort, they keep open the prospect of alternative understandings of our historical setting.

These challenges then pose deep questions concerning the ways in which human beings, in particular human values and the ends of life, are to be understood in themselves and in relation to human sciences and technologies. They are of first rate importance to pursue.

2. WORLD VIEW CHALLENGES

Closely related to the former issues in many cases are questions arising from alternative conceptions of various fundamental aspects of the world. If the issues concern the nature of values and the ends of life, we may quickly return to framework challenges.

But there are other debates, e.g. between neo-classical economic conceptions of *homo economicus* and alternatives ('buddhist', Kantian, communist, etc.), between centralist contractarian approaches to socio-political structure and alternatives (Platonist, anarchist, Catholic Christian, communist), between capitalist-industrial conceptions of technology and resource use and alternatives

(appropriate technology, conserver society, 'soft' policy paths). These issues are raised e.g. by Jackson, Knelman and Tester.

They do not simply concern specific problems, but the framework for the formulation and evaluation of problems. They concern, not simply specific methodologies and techniques, but the choice of *kinds* of methods and techniques - *and* the recognition of limits to them. Like framework challenges, these issues reveal the basic assumptions on which all else to follow ultimately rests.

3. FUNDAMENTAL THEORY CHALLENGES

There is a useful distinction between general, fundamental theoretical principles and detailed theories of particular subject matters, e.g. between the general principles of thermodynamics and the specific theory of heat pumps, between the general theory of economic choice and the specific theory of industry location. The distinction is useful, though not always sharp. Here we concentrate on the level of general theory.

There is at present no general theory of the technology:society interface, i.e. no general theory of how technological change interacts with social change (Mowshowitz), no general theory of the structure and dynamics of human life as a time-structured development and of the resulting occupational, locational and social dynamics which that structure induces (Brusegard), no general theory of a conserving, environmentally compatible economics (Jackson). These lacunae and others like them stand in the way of developing a coherent framework for the evaluation of societal activity, even when world view assumptions are clarified.

With respect to science itself, we have no general theory of the nature and dynamics of 'pure' science and of the science:society interface (Bindon), and much too little empirically-based theory of the historical development of scientific institutions, the historical effect of public science policies on scientific research, and so on. There is no recognised theory of the proper relation between scientific information and public policy making processes (Miller, Sutherland).

These latter issues point to even more serious lacunae: there is no coherent theory of values and ethics capable of acting as a framework for the normative dimensions either of public policy making and like societal issues or of the specific dilemmas posed by particular technologies (Braybrooke, Hoffmaster, Jackson, Keyserlingk).

It is obviously impossible to progress far in understanding while operating with piecemeal frameworks (though framework progress is often stimulated by piecemeal progress).

4. INSTITUTIONAL CHALLENGES

All of the foregoing challenges in effect call for changes in the direction and balance of research and its use by various segments of society. None of these changes can be accomplished without corresponding institutional changes. Some see these changes as simply those appropriate to removing societal ignorance, others see them as part of a fundamental challenge to the political economy of western society. Whatever the view, all are agreed that research and development institutions themselves need researching for alternatives and alternatives developed, that research-supporting institutions likewise need the same attention and that the relations between both sets of institutions and the various interest groups in society need careful and urgent attention. (See e.g. Bindon, Carpenter, Demirdache, Guédon, Miller). Some of these issues are taken up in Part IV.

5. CHALLENGES TO DEVELOP SPECIFIC THEORIES AND BODIES OF INFORMATION

If there are wide lacunae in our body of general theory, there are myriad specific theoretical and data gaps. Rather than attempt an exhaustive list I offer some examples from the background papers. Bindon: Lack of information on the institutional structure/functioning of science; Brusegard: lack of theory/data on the relation of subjective life satisfaction to objective social indicators; Demirdache: lack of a theory of combining normative and descriptive aspects of technology assessments; Hoffmaster: lack of a definite theory of the impact of the health care institutional context on ethics of individual decision making; Tester: lack of specific methodologies for obtaining and combining inputs to social impact assessments from differing cultural groups (including sub-groups within western culture).

6. SPECIFIC TECHNOLOGY FOCI

Many authors wanted to concentrate on a specific technology in all its dimensions (e.g. energy technology) or on a specific human function in all its aspects (e.g. communication), rather than select only a specific theoretical dimension (e.g. ethical issues). A specific methodology (e.g. empirical sociological study), a specific level of concern (e.g. managerial, or philosophical) or any other partial study. The richness of a given technology transcends partial approaches and brings them into interaction with one another, as I have earlier tried to illustrate. Hoffmaster, Keyserlingk, Mowshowitz and Valaskakis/Martin all represent this approach to some degree.

In conclusion, Part III has offered several different structurings of themes and issues for the HCST field. None can be taken to be more legitimate than the others, each sheds light on the inter-relations among issues and themes in the field and adds to the sense of richness and depth which the field indeed possesses. There is no embarrassment to these riches - indeed, every substantial field (including basic disciplines) can be cross-categorised in a similar way. Besides attempting to provide a rich operating conception of the HCST field for the reader, and to motivate its support, the main import of this exercise is that abstracted attempts at producing the conceptualisation of the field should be set aside in favour of pursuing the issues within it.

IV. INSTITUTIONAL ISSUES

The concerns of this section fall into two parts, (i) a concern with processes for the future development of the HCST field; (ii) a concern with processes for the formulation, evaluation and support of HCST research. I shall deal with these in order.

DEVELOPMENT PROCESSES

The HCST is diverse, complex and young; many researchers are just discovering that their concerns are committing them to its support. As little as 10 years ago, e.g., there was little perception of energy as posing comprehensive technology design and development problems, and no perception of its deep social and human values ramifications. Most of the North American institutes concerned with ethics and public activity did not then exist. The three impact assessments (social, technological, environmental) either did not exist or were in their infancy as public movements. The HCST field needs forming, nurturing and extending.

Interaction is of the essence for the HCST field. HCST is inherently inter-disciplinary in nature and can only effectively develop through extensive, coordinated interactions among those involved. Constructive interaction was a primary aim of the November seminar meeting; the diversity of people chosen and the interactive process chosen were both designed to allow the participants themselves to define their mutual and complementary concerns.²⁶ Participants in that seminar not only felt that it largely achieved its aim of stimulating constructive interaction but were firm in their conviction that opportunities to continue and extend such processes were essential for the health and development of the field.

The evaluation process itself revealed a fund of scholars who were involved in various aspects of the field but were prevented from becoming directly involved, largely because of the time constraints. One has only to reflect on the commitment expressed by the teams of commentators who wrote from Calgary and Halifax to recognise the potential for involving a wider resource base.

Promotion of a continued process of interaction and development would not only directly and crucially benefit the field at this point in time, it would also lead to higher quality research proposals to Council. Imaginative, integrated research proposals have only begun to emerge in this field in the past decade, clustering around problems most recently in the public eye. There is still an urgent necessity to explore richer analyses of problems and opportunities for anticipative, rather than simply reactive, research. And in the

longer run not only Council, but the larger Canadian community, will benefit. There is every reason to believe that education will be a special beneficiary, since especially at the tertiary level, it tends to suffer from an absence of strong inter-disciplinary material.

It is therefore recommended to Council that deliberate and substantial support be given to successor activities.

The principle aim of this support is to foster and extend relations among researchers with commitments in the HCST field. The intention here is for Council to provide "seed money" to develop the field. The appropriate administrative form and time-frame for such support is left open for further discussion.²⁷

Activities supported could include regional and/or problem-oriented meetings and the development of structured information exchanges. At this point in time it is important to build networks of scholars with related interests so that coherent and sustained work may proceed. To take an example, modern communications/computer technologies have the potential to revolutionise many aspects of Canadian social structure and functioning. At present there is a welter of government interests (e.g. Department of Communications, Canadian Radio and Television Commission, Ministry of State for Science and Technology), affected user interests (e.g. various unions, Consumer Affairs Association), various other public interests (e.g. the Kreiver Royal Commission, Civil Liberties Association) and a large number of diversely located scholars (in e.g. computer science, philosophy, communications, languages, library science and other university departments and in private research companies), virtually all of whom find it difficult to communicate with one another systematically, yet all of whom need to be brought together around this issue if an intelligent *human* response is to be made. Although some relevant discussions have occurred, e.g. those under the auspices of GAMMA, there is no focus for activity (i) with a broad interest base (e.g. covering the groups listed above) and (ii) specifically directed to the social/human values implications of alternative policy choices.

A second important aim of these activities would be to educate people in the opportunities and responsibilities which the field represents. Discipline-trained scholars need time and opportunity to relate their expertise to wider concerns, users need time and opportunity to relate their concerns to unfamiliar expertises.

Education for the HCST field is no mean feat. The bitter experience of those who work in inter-disciplinary settings attests to the multiple barriers that stand in the way of people's breaking out of their disciplinary constraints (Not only jargon and methods need to change, but subtler aspects as well, such as risk perceptions and preferences and ways of relating to other researchers.) The word "inter-disciplinary" often masks "disciplinary serial monogamy". At present the only reliable method of overcoming these constraints is to have projects guided by people who have themselves personally crossed disciplinary lines. Expanding the numbers of people with first hand experience of this sort

would be an important contribution to Canadian research and education - particularly so for breaking down barriers between the humanities and the sciences (social and natural). Council is uniquely placed in the Canadian setting to support these valuable developments.²⁸

In sum, the seminar group was firmly of the opinion that the development of communication/cooperation networks, with the coordinated perceptions of problems and research opportunities, the experience with coordinated ways of working to help resolve problems, and the continuing education of a wider group which would ensue, would all be highly worthwhile in itself as a contribution to Canadian society quite aside from the research activities which ensued from these processes.²⁹

DECISION MAKING PROCESSES

Now I turn to the other aspect of institutional concern, the concern with processes of support for HCST. The gist of the concern is that just as our unique historical situation calls for re-thinking the aims and processes of research, so too it calls for re-thinking the aims and processes of research support. Some of the individual concerns expressed are:

- The need to examine the potential and limits of strategic or directed funding and how it is best institutionalised; the need for an open funding process responsive to the inter-disciplinary character of the HCST field.
- The importance of providing information generated by researchers to groups who would find the research, or research proposals, relevant to their concerns.
- The need to provide a means whereby various research-deprived social groups, i.e. groups who presently find it difficult to have relevant research funded, can propose research projects to the research community.
- The importance of establishing a pool of inter-disciplinary researchers and representatives of affected groups to act as evaluators of research proposals, and to have such people represented in Council's decision making processes.

These and a variety of related, more detailed concerns expressed during the evaluation process can, I believe, be focussed into three issues:

- The problem of providing equitable access to research by all groups in Canadian society.

- The problems raised by Council's moving into the strategic or directed funding area at all.
- Special problems to supporting inter-disciplinary HCST research.

There was a majority approach to addressing these concerns; roughly, ensure diverse, but balanced, representation in Council's procedures, with appropriate mandates. There was a minority caution against exceeding competence by making institutional recommendations at all, and I will return to the issue later. Everyone was agreed, though, that these were issues which should be addressed somewhere and it is in this spirit that I proceed.

Research equity: Everyone agreed, I think, that there were substantial inequities in the access which various groups have to research and that these need correcting. To remind; unions, cooperatives and women's groups, among others, often find it difficult to become informed about, and to gain access to, research that is relevant to their needs. Conversely they, among other groups, have at present no formal channels by which they can propose appropriate research topics to the research community that would be in the proposer's interests to investigate. This led to a general recommendation that *the relevant decision making groups within Council contain significant representation from a widely varied community base* (e.g. from business, union, consumer and other groups - see examples above).

Project selection/evaluation panels, strategic goal formulation groups (if any, see below) and Governing Council itself were thought to be appropriate places to ensure such representation. This was not a suggestion to have "users" dominate proceedings, but rather to inform proceedings with wider perspectives. Rather than large numbers of people reproducing various voting blocs, what was envisaged was a few people who would educate themselves in the field and bring to bear the concerns of their groups to broaden the perspectives and possibilities in the proposals.³⁰

These changes would not, by themselves, address the issue of a channel for community-based research proposals to come forward. Thus an additional recommendation was that Council explore administrative means to this end. Detailed ideas were not discussed in depth; one discussion group's thinking on these matters can be gleaned from their group notes, reprinted as Annex 3 to this paper.

*Strategic Funding:*³¹ Recent years have seen the rise of "strategic research" funding in public research supporting institutions. Whether this shift be justified in terms of accountability, efficiency or reducing the unmanagability of social decision making, it is well to be aware that we are engaged in an experimental exploration of shifted institutional arrangements which will inject a greater component of directed research.

For the moment it is salutary to remind ourselves of the disadvantages of 'top-down' direction. As tempting to some as the political control of research might be, from the societal point of view there seems reason to believe that beyond a certain point there is a law of diminishing returns. Neither basic research nor its creative social application thrives in strongly directed settings. In the current historical setting for the HCST field, we face (i) a massively complex field, (ii) a field many of whose components are newly emerging, lacking clear definition and social experience, yet (iii) a field of rapidly increasing social importance. In these circumstances, it is particularly critical for the HCST field, and Canadian society, that premature judgements in a directed setting not distort the development of the field. Though views as to how to approach these issues varied widely, there were two recommendations which enjoyed widespread support.

The first recommendation was that *Council should temper its own role in any directed or strategic research programme with strong participation from both the affected research community (e.g. HCST and related disciplinary researchers) and the wider community of interests (e.g. from the various institutions already mentioned).*

The second recommendation was that *whatever structure Council imposes on strategic research programmes, it should permit a reasonable latitude of choice of research projects.* Constraints on an HCST programme presumably should not, e.g., eliminate research proposals in any of the HCST areas, or concerned with any of the themes discussed in Part III.³²

Institutional approaches in the spirit of these recommendations fit well with the remarks on priorities in Part III.

HCST Involvement: The HCST field is particularly vulnerable to discipline-based dissection, an act which would rob it of much that is intellectually distinctive about, and methodologically necessary to, its pursuit. It would also destroy its integrated approach to its motivating problems. This suggests that *people working the HCST field itself should be active in the selection and evaluation of projects.* This in turn adds significance to the earlier proposals to develop the field's membership and strengthen information and working linkages within it. The larger the pool to be drawn from and the better informed people are of what is being done and worth doing, the more helpful are likely to be choices of priority and project evaluations.

The seminar discussion made no suggestion that only HCST people should be involved; that extreme runs the danger of self-serving biases, the complementary danger to disciplined dissection. Moreover, it was generally, though not universally, acknowledged that each project should be well founded in the basic disciplines which support it. Thus there is also an appropriate role for discipline-based assessors who have no special commitment to the HCST field. As in all matters, it is a question of balance. There was a widespread view that at present inter-disciplinary proposals tend to suffer from inappropriate, and sometimes unsympathetic, review; in many cases there

is literally no administrative channel designed to accommodate them. Hence the concern expressed that the balance needs to swing in favour of the HCST field, but not so as to abandon all discipline-based review.

In the same spirit, there was hope expressed that future activities would see more involvement by members of the Governing Council and Academic Advisory Panel - not with the intention of altering their formal duties, but to engage them as people in the field and to familiarise them at first hand with its problems and promise. This recommendation might be more apt for a Governing Council with the broad-based membership discussed earlier.

As to the setting of priorities, caution about approaching the matter too hastily, even by a group of involved researchers, is evident in the limited conclusion reached in Part III. Many people would clearly prefer that Council restricted itself to simply funding the field, leaving it to a broad-based evaluation process to decide support, intuitively guided perhaps by the considerations adduced in Part III. Others would be inclined to go further and, e.g. attach priorities to research proposals that would pursue one or another of the themes mentioned in Part III, or even attempt to develop specific guidelines (such as those outlined in Annex 2). All would agree, I believe, that if more specific priorities are to be developed then (i) they should be arrived at through an open, broad-based consultative process of the sort discussed in this report, and (ii) the process should be flexible, i.e. the priorities chosen should be regularly reviewed in the light of re-evaluated needs, and the decisions reached for any given time period should be subject to revision if a project widely agreed to be more worthwhile comes along.³²

In conclusion, there are many ways in which Council might realise these three sets of recommendations, if further reflection reinforced their merit. The group was conscious of its lack of experience in these areas. One suggestion which was discussed was that, following precedent in other research agencies, Council might consider creating an HCST Advisory Board, with membership drawn from (i) the HCST field, (ii) basic disciplines, (iii) community representatives, to evaluate proposals and to report directly to the Governing Council. These ideas come from seminar discussion group notes reproduced in Annex 4 at the end of the report.

Finally, the group at the seminar weekend expressed some concern that Council, having decided to move into the strategic grants area and having so openly consulted the research community, should also make public the process and criteria to be followed in evaluating the strategic grants proposals. There was, however, no agreement on how this would be best accomplished.³³

C O N C L U S I O N

I have written what I believe to be a "majority report", a report that reflects the perceptions and commitments of a majority of the diverse and rich group of researchers now beginning to come together.

I have written the report under severe time constraints. Others will no doubt see the blemishes I have not yet seen myself. I am confident they will point them out. There has, however, been a little time to reflect on the development of the field and to refer to the documentation generated.

It seems clear to me there should be a continued development of the field, of the rich relations among those who have been involved and more to be added. I hope this development will proceed, at least at the level of an 'invisible college', irrespective of Council's decisions, such is its potential value to the Canadian community.

I also hope that this report will be found an adequate point of departure for a more formal, more visible, more effective development of the concerns of the HCST field.

*C.A. Hooker
London, Ontario*

November 26, 1979

F O O T N O T E S

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1. Titles are always sources of irritation for the sensitive, sources of unease for the suspicious and opportunities for manipulation for the ambitious. Council's original title was "Science, Technology and Human Values" but various people found this objectionable (for example because it placed human values second, or because it spoke in terms of human values at all rather than interests, etc.). The title chosen above, HCST, will hardly prove less controversial but it has been chosen in good will (i) to reflect the primacy of humanity over its science and technology and (ii) to avoid precluding human concerns by a too narrow designation. There are existing titles which some would have preferred used, perhaps for example, "History and Philosophy of Science", Science and Technology Studies", but these titles already point to groups with historically developed concerns which have in fact turned out to be of a more restrictive sort than the intended scope of the HCST field. Better than any titles, the scope, richness and open-endedness of the intended field can best be appreciated by reading the remainder of the report.
2. Council's initial recommendation was six more extensive treatments, but under the time constraints it was decided that more, less onerous papers was more realistic. In the event, three commissions did not eventuate in papers due to pressure of time and one paper was added. In fact, many of the background papers are of fine quality and represent exemplary efforts in the circumstances.
3. Those invited are indicated in Annex 5. In the event, pressure of time and various other circumstances forced the late withdrawal of eight of these: Beauchamp, Desroches, Goudge, Overman, Stewart, Wynne-Edwards, Valaskakis and Zeman.

There was time explicitly set aside at the seminar to set down written comments which could be used in the preparation of this report (see seminar programme, Appendix C). These comments proved a useful review of the seminar and a useful source for this report. They are not reprinted here, partly because they exist only in rough handwritten note form and partly because many of them were written in confidence.
4. Some 67 people in all were invited to comment, of those 17 responded negatively, and 29 positively, the latter being sent background papers. Of those receiving background papers, 24 submitted written comments, which are reprinted in Appendix B. Particular mention may be made of the Center for Human Values (Director: Professor J.A. McCormack) Halifax, and The Calgary Institute for the Humanities (Director: Professor E. Lee) Calgary, each of which assembled a team of commentators to review the background papers.

5. See Annex 5. For example, Steven Goudge was invited because of his experience with the Berger Royal Commission, Andrew Thompson because (among other qualifications) of his involvement in the Canadian Arctic Resources Commission, Peter Warrian to contribute his workplace union perspective, Glen Horst because of his combined clinical and theological experience in a minority (Mennonite) community setting. The Business Council on National Issues was contacted, but in the circumstances was not able to involve itself in the process.
6. Professors Bindon and Guédon are of course partial exceptions on the sociology side, but their interests and orientation cannot be pinned down primarily to either of these categories. Part of the failure to involve others had to do with selectivity on our part. We looked for practitioners with a genuine, central, and inter-disciplinary research interest in this field, not pursuing people who are primarily oriented to a specialist discipline. Part of the failure had to do with the apparent absence of such people from the Canadian research community, or with the reluctance of potentially relevant people to become involved in a wider-ranging process of assessment.
7. CAH is the exception in this latter instance, with Michalos a partial exception. Favourable general responses were received from Professors Northrop Frye and George Grant in this connection, but pressure of time forced both to withhold involvement.
8. Some examples are: Institute of Man and Resources, Prince Edward Island; private technology development firms; Consumer Affairs Council; Civil Liberties Associations. Many other examples could be added.
9. In the first case research topics such as "Innovation in a Cold Climate, Cultural and Social Dimensions" might be funded; in the second case such problems as "Energy and Nuclear Power, the Normative Issues", common to many nations but perceived as important Canadian issues, would be eligible for funding, while in the third case existing research personnel would simply receive added support.
10. Of course disciplinary research may also be understood as the pursuit of valuable knowledge. Moreover, there is controversy concerning precisely how scientific research is to be understood. For the purpose of illustration, a contrast in degree, rather than kind, between HCST and basic disciplines will suffice.
11. Those who concentrate on the empirical study of science sometimes argue for its also being a basic discipline, but this obscures its relations with other interests in the practice of science and technology and suggests a misleading exclusivity; thus the pursuit of an understanding of science and technology using the methods and assumptions of empirical enquiry is acknowledged, but it is viewed as part of the larger "criminology model" of the field.

12. As will have been made evident by this discussion, useful work in the area will often (typically) have strong connections to related disciplinary-based work. Many of the participants thus saw it as important that formal relations for the support of such connections be developed, e.g. with the National Science and Engineering Research Council and the Medical Research Council. Equally important to Council and the field will be maintaining healthy working relations with other public agencies, e.g. the Ministry of State for Science and Technology.
13. Some people prefer to speak of interests and actions and to limit values talk to descriptions of actions after the event, others regard values as primary motivating forces. These are not unimportant differences in theory, but I have submerged them in a general concern with clarifying the bases for social choice and implementing acceptable choice processes.
14. This is a particularly important principle in the present circumstances where there is an explosion in the use of social sciences methods in this area, of uneven quality, which threaten to submerge the guiding human interests and questions beneath a welter of mere "data". This opinion was widespread among those with social science interests at the seminar as well as in the written materials (cf. Appendix B).
15. Other approaches to organising the projects could have been adopted which would have served the present purpose just as well.
16. See Carpenter.
17. See Hoffmaster.
18. See Hoffmaster, in this volume, for a series of research suggestions for the biomedical area, both at the general and the specific levels.
19. This examination is, of course, appropriate for other technologies as well, (e.g. communications).
20. See Demirdache, in this volume.
21. Many other examples of this sort could be provided; one was chosen to represent a wide class of specific concerns actually mentioned.
22. See Mowshowitz, in this volume, for a number of other project selections and an elaboration of the rationale for emphasising the development of an integrative framework.
23. For further details of these and other suggested projects, see Valaskakis, Martin, in this volume.
24. See Braybrooke, in this volume, for a motivation for such studies and for an elaboration of suggestions for further work in the same vein.

25. See Brusegard, in this volume, for other suggestions concerning work on social indicators.
26. Thus the main purpose of the initial characterisation of the field presented in my letter of September 21 (Annex 1) was to ensure width of participation, to avoid an advance reduction of participation to some narrower subset of concerns. Beyond that the intention was to encourage the community of participants themselves to define their interests. This process was, I believe, largely successful.
27. Professor Bindon has suggested a need for some form of permanent institution; however, this issue was beyond the scope of the present evaluation process.
28. Indeed, hope that Council would see its responsibilities in this way ran to the point where there were serious suggestions discussed that selected Council staff might take particular responsibility for the field and ultimately, in collaboration with active researchers, actively encourage (though neither force, nor automatically underwrite) the development of collaborative efforts, new research directions, etc. Others were more cautious of such an expanded role and the idea is simply put forward for further discussion.
29. Some people stressed the difficulty of steering a middle course between too "professionalising" the HCST field through these developments, thereby producing an irrelevancy and inaccessibility which would stultify the field, and providing too loose a network which would eventually fragment and collapse. Others were eager to see the field, or some part of it, achieve formal recognition, e.g. alongside other learned societies.

Certainly it needs to be recognised that what holds people in the field together is a subject matter and certain problem-centred interests in it and that both of these are dynamic, changing over time. On the other hand the general importance of science and technology is not likely to decline in the foreseeable future, neither are the problems humans face. What seems to be needed at this time is support for a period of experimental exploration of which institutional forms best suit the field - meanwhile working on issues within it.
30. There were some who were sceptical of the effectiveness of broader representation to address issues of inequity in this context, though there was wide agreement that such groups anyway deserved some form of representation in Council. Others emphasised that strict equality of access, as opposed to openness of access, was also not likely to be an achievable or especially desirable goal, but again there was broad general agreement that many existing inequities should be removed.

31. I insert this discussion, despite its political sensitivity, because I believe that not to do so would be to mask a crucial dimension to the process. The remarks to follow are my own formulation of the issues; I have no hope they will be uncontroversial. I can, though, confidently commend to Council the importance of remaining sensitively aware of these issues as it deliberates its course of action.
32. There has been one suggestion that Council should seriously consider funding the best projects in each of several strategic programmes, rather than fund only one additional programme's projects, both to avoid the disruptive effect of entering and then pulling out of a field over a short time frame and to avoid sacrificing high quality projects in other areas to greater quantity in one. The suggestion is left for Council to consider.
33. A proposal to ask Council to make a very formal declaration of these matters came to a vote at the seminar (the only issue thus forced); ten were in favour, seven against and five abstained. It is nonetheless to be hoped that Council will respond positively to the general concern.

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A N N E X 1

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STRATEGIC RESEARCH FUNDING PRIORITIES IN THE DOMAIN OF SCIENCE, TECHNOLOGY
AND HUMAN VALUES

September, 1979

DESCRIPTION:

I conceptualise the area as organised vertically in three levels:

| | | | | | | |
|-----------|--|---|--|--|---|---------------------------------------|
| LEVEL I | (General Theory) | : | Theory of Personhood Humanness | Moral Philosophy (Ethics, Value Theory) | Social/Political/Economic Philosophy | Philosophy of Science |
| LEVEL II | (Theoretical Tools for Assessment, Management) | : | Social & Economic Indicator Quality of Life Theory | Policy Analysis and Planning/ Institutional Theory | Technology/ Environmental Impact Assessment | |
| LEVEL III | (Applied Fields) | : | Bio-Medical Ethics | Energy Policy/ Institutional Conserver Society | Computers & Society | Communications Technology and Society |

None of these levels stands independently of the larger context. For example, Levels I and II presupposes the larger philosophical context which includes metaphysics, epistemology and rationality theory and philosophies of religion and culture, but Level III, in particular, requires historical studies of the development of the problematique in each area, this is true of Levels I and II as well; all three levels require complementing by several, often all, natural and social sciences. The point is that these eleven sub-domains are singled out by their strategic relevance to the problem domain broadly designated by Science, Technology

and Human Values. Equally, those fragments of the theoretical sub-domains which represent their special features responding to Level III issues have the primary role here. Finally, there is mutual interaction among the sub-domains, both horizontally and vertically; while Level I informs Level II which informs Level III, experience gained in Level III areas supports or undermines Level II and Level I positions and, because of this and via horizontal transfer at Levels I and II, affects other Level III areas.

I diagnose our Western historical legacy making for this problem area, very briefly, thus: A (1) An unprecedented development of institutionalised science (broadly conceived) acquiring an unprecedented role in historical transformation, (2) producing public actions with unprecedentedly deep-going, wide-ranging and long-lasting effects, (3) calling for an unprecedented role for intellectual/institutionalised tools for the assessment and management of actions, programmes and the like, but B (1) these circumstances have arisen in an intellectual legacy of empiricist models of science which exclude all normative (evaluative) considerations, (2) a formalist model of mind and value which renders moral philosophy irrelevant to public historical guidance and to science and (3) a liberal politico-socio-economic tradition which excluded consideration of these areas from legitimate collective experience, with the combined result that C historically forced theoretical and practical developments in these sub-domains have occurred at an ever accelerated pace but unsystematically, tacitly, fragmentarily.

I understand the task at hand to be this: organise a conference whose ultimate aim is to prepare structurally justified assessments of research opportunities and priorities in this domain. By structurally justified I intend: an assessment arrived at after a careful review of the relevant field, informed by a theory of how the field ought to be structured, the subsequent recommendations for research emerging from a comparison between what the review discloses and the structural theory requires. I understand there to be four major constraints to be satisfied: (1) What emerges should be a unified or interpreted evaluation across the entire domain, (2) it should be in a form readily accessibly to SSHRC, (3) preparation and conference should meet a given budget and the evaluation should be available not later than November 30, 1979. The constraints are severe and the sub-domains involved are huge (literally thousands of people are now involved on a day-to-day basis and even the relevant bibliographies run to thousands of pages, let alone the original publications). Frankly, I doubt that the primary goal can be easily met subject to these constraints. What can reasonably be done is to select some of the best available people whose interests range across the problem domain, persuade them to throw their energy behind the task and rely on their experience for the quality of the result.

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A N N E X 2

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GROUP 1 - RECOMMENDATIONS

(Reproduced from notes prepared by C.B. Hoffmaster^{*})

Michael Bayles Glen Horst
Barry Hoffmaster Judith Miller

I. Introduction

Although many of these issues may seem unique to the biomedical area, in fact analogous questions should be asked about other technologies.

The lists of questions are representative, not definitive.

Research projects in this area should be done by interdisciplinary teams including clinical and social psychologists.

II. Criteria for Picking Substantive Issues for Research

1. Affects significant percentage of Canadians
 e.g. foetal monitoring
 subliminal messages
2. Addresses questions that have not already been extensively researched and the research is not likely to be funded elsewhere. Is it likely that we can say anything new?
 e.g. of heavily researched areas: abortion, informed consent, death and dying, human experimentation.

* These are informal notes, prepared by one person only, for discussion at a plenary session; they do not necessarily represent in detail the views of each member of the group.

- e.g. of little researched areas: cryobiology, longevity.
3. Challenges existing social conceptions, values and structures,
e.g. in vitro fertilisation and embryo transfer with host mothers, electrode implantation, life extension technologies.
 4. Meets perceived need for guidelines by significantly involved group,
e.g. of groups: researchers, clinicians, consumers.
of requests for guidance: prenatal diagnosis, artificial insemination by donor, recombinant DNA.

III. Meaningful questions that research should address: with regard to either new technologies or technologies already in place.

A. In area of technology development:

1. Can society economically afford to implement the technology?
2. Will the technology and its foreseeable utilisations increase/decrease individual freedom and quality of individual and social life?
3. What are alternative developments or changes which meet some function and how do questions 1 and 2 apply to these?
e.g. life style change in diet as low technology alternative to high technology artificial organs.
4. Does the technology address an important need?
e.g. in vitro fertilisation.
5. How important is this need compared to other needs?
e.g. cancer vs. arthritis research.
6. Will the research focus on treatment of particular problems or on prevention of it?
e.g. oil spillage clean-up techniques vs. safer transport research vs. alternative energy sources.
by-pass heart operation vs. exercise programmes.
7. How do people affected by a new technology perceive the changes? Need for recognition of and respect for cultural diversity.

8. What health and safety hazards are associated with the development of the technology and its use?

B. Technology deployment - policy level:

1. Ask questions 3, 4, 5 in technology development,
2. Is this the least resource consumptive means of fulfilling the function?
3. Does/will the distribution reflect the distribution of need throughout the population?
4. What groups, persons or institutions do/will control access to and use of the technology? (centralised/decentralised?)
5. Will there be continuous review procedures to ascertain whether all above points are met?

C. Use of technology - individual decision-making level:

1. How widely disseminated is information about the technology and its alternatives?
2. Do all those who will use the technology or to whom it will be applied have information concerning risks, benefits, procedures, etc?
3. Do all those who will use the technology or to whom it will be applied have the freedom to refuse to be involved in the use of the technology?
4. What institutional mechanisms exist to ensure that (3.)?
5. Are referral or alternative ways of getting access to the technology available?
6. What is the effect of the language used in informing and addressing the user?

IV. Structural and institutional issues.

(Caveat: Many of these apply to the technologies as well.)

A. Decision making:

- how do individuals decide what to do?

- how different models of decision making affect the decisions?
 - e.g. hierarchical system
 - colleagial system
 - adversarial system
 - interdisciplinary teams
 - professional-patient decision-making
 - role of family in the process.
- B. Provision of services:
- fragmented vs. comprehensive services
 - coordination between health and non-health services
 - physical and temporal proximity
 - degree to which delivery preserves patient's normal social environment.
- C. Physical design and how it affects delivery of care.
- D. Concepts of health and disease:
- how affects organisation of health care delivery system
 - source of possible conflicts between professional and patient.
- E. Organisational structures and conflicts between administrators and professionals.
- F. Nature and health care education:
- admissions
 - interdisciplinary nature
 - subjects (e.g. ethical issues)
- G. Relation of health care systems to other social structures:
- drug manufacturing industry
 - medical apparatus manufacturing industry
 - political system - regulatory agencies
 - labour unions
 - funding mechanisms
 - legal system
- H. Status and prestige within medical professions and how it affects health care.

V. Suggestions for specific research topics:

A. Technologies in place (already developed and deployed):

- behaviour modification/control drugs - e.g. moditen for schizophrenics
- foetal monitoring
- ultrasound
- X-ray technology (e.g. oversue of dental X-rays)

B. New technologies:

- genetic surgery on a foetus
- artificial organs (e.g. pancreas)
- maternal serum alphafetoprotein screening.

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A N N E X 3

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GROUP 2 - FIRST SUMMARY

(Adapted from notes by J-C. Guédon^{*})

| | |
|--------------------|-----------------|
| George Bindon | John Schumacher |
| David Braybrooke | Bill Vanderburg |
| Jean-Claude Guédon | |

Process for Funding Research

A preliminary remark: technology and science take social meaning because they are produced, reproduced and appropriated, i.e. because they are inserted within specific social processes.

Accordingly we tried to work on modalities of production, reproduction and appropriation so as to influence the social meaning of science and technology.

These are some ideas we came across:

- (a) Fund public interest science research along the lines of legal aid, Consumers' Association and other private interest groups.
- (b) Assuming an individual submits a proposal within the general boundaries of targeted research, then the review would expand the peer group to include other interest groups. In this fashion, review would involve quality and relevance factors. (An example might be a study looking at social impact of moving from assembly line to team work in factories.)

* These are informal notes, prepared by one person only, for discussion at a plenary session; they do not necessarily represent in detail the views of each member of the group.

Also, a special pool of people with wide backgrounds could decide which groups are likely to be concerned with this and that piece of research and who should do the reviewing; again, fair representation of interest groups is essential.

Also, the author of each proposal could identify which groups it means to address. SSHRC would have pools of names from such groups to obtain reviews.

- (c) Conversely, special interest groups could submit proposals to SSHRC and this body in turn would let it be known that research can be funded on this or that specific project. (Possible form: SSHRC administers a contract for particular interest groups.)
- (d) Eventually fund search for new and positive ways to organise data and statistical time-series so as to correspond to needs of potential users who would make themselves known to SSHRC (this can be construed as a particular example of (c)).
- (e) Another specific example: fund research which could redistribute social science research so as to foster counter-use (to present privileged uses) of this knowledge.
- (f) Some discussion was raised about both fundamental research and also pedagogy. In particular, it was suggested that research be done in order to find ways to transmit fundamental issues to undergraduates in an intellectually accessible fashion. (At this stage, the user groups or interest groups would be both teachers and students who could be called to evaluate possible proposals.

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A N N E X 4

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GROUP 5 - DISCUSSION SUGGESTIONS

(Adapted from notes prepared by C.A. Hooker^{*})

| | |
|---------------------|---------------|
| Lew Auerbach | 'Bus' Holling |
| Alan Fox | Cliff Hooker |
| Marc-André Fredette | |

A. Process Suggestions

Theme: The importance of continuing this process to promote interaction and collaboration

Needs: - to identify a larger pool of interested people.
 - to identify opportunities for research, especially research collaboration, in the field.
 - to identify more accurately issues, problems, integrating themes in the field.
 - to educate people, especially related disciplinary researchers and impacted community groups.
 - to relate work in the field to its disciplinary bases, as much to change the latter as to learn.

Possible Approaches:

- use problem/issue-focussed discussion groups.
- use regional discussion groups.
- develop a written exchange of views on selected topics ("written seminar" concept).
- employ specific structured approaches, e.g. an interaction matrix where each demands advice/information of the others and assesses development in his own expertise area in the light of this.

* These are informal notes, prepared by one person only, for discussion at a plenary session; they do not necessarily represent in detail the views of each member.

B. Managerial suggestions

Theme: Create a broad-based group intermediate between the researcher and SSHRC Governing Council to oversee strategic grants programme.

- Needs:
- To include (strongly) members of HCST field, to ensure insightful/fair evaluation of interdisciplinary aspects.
 - To include "user" or impacted group representation to ensure broad enough perspective, balance to work effort, accessibility of results, etc.
 - Needs to review completed projects as well as evaluate proposals in order to accumulate perspective on valuable approaches.

Possible Approach:

- A strategic Grants Board having HCST and user membership, plus disciplinary membership.
- Board reports directly to Governing Council (because Academic Advisory Panel has defect of acting as disciplinary dissector).

Other Suggestions:

- Some Council staff take a special interest in the area, eventually helping to stimulate new proposals, advising on collaborative opportunities, etc. (Only in collaboration with HCST researchers, no coercion, no advance guarantees).
- That Governing Council consider joining one or more discussion groups to 'get a feel' for the area.
- That Governing Council consider appointing from a wider community than at present, e.g. to include union (research) representation, public interest groups (e.g. Friends of the Earth) etc.

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Science, Technology and Society Studies:

Difficulties in the development of the field, and some
problems particular to Canada

A discussion paper

by

George H. Bindon

For the workshop on science, technology and values

University of Western Ontario

November, 1979

This brief discussion paper has three parts: a review of some of the literature that has attempted to define the field of Science, Technology and Society Studies (STS), followed by a crude model that may be useful; an examination of some of the particular problems facing the development of this field in Canada including comparisons with activities in some other Western countries; and finally, based on the above, suggestions for the development of research and teaching in the STS field in this country.

I. STS Studies: definitions

In his essay "The Science of Science" published in 1964 in an anthology with the same title, Derek de Solla Price referred to this new field as "...a second order subject of first order importance" (Price, 1964, p. 195). In this, he was making a comparison with historiography although he rejected as sounding "phony" the adoption of such neologisms as scientography or scientosophy and noted that the term scientology had already been appropriated. Humanities of Science was suggested as a term that might refer to the humanistic study of science (Price, 1964, p. 201). Sarton coined "para-science", but this too can have a negative connotation.

Although written fifteen years ago, Price's essay remains as good a polemic for the field as any which has appeared since. Included in this proposed study were the quite mature areas of history and philosophy of science, the rapidly developing sociology of science and studies of the science-government relationship, the promising new work on the psychology of scientists and the economics of science. Price discussed the problems associated with the more restricted

meaning of the term "science" in the English language, and pointed out that it should be understood that the field must also deal with technology in all its aspects.

The first problem was that "...the expertise of these several branches of study is largely derived from the parent study; history of science being a sub-discipline of history, sociologists of science being mostly professional sociologists in the first place" (Price, 1964, p. 198). This results in a lack of coherence and comprehensiveness in the study of science and technology, a problem that has yet to be overcome (Schmandt).

The publication in 1977 under the auspices of the International Council for Science Policy Studies of the 700 page, 15 chapter "state of the art" overview of the STS field, edited by Ina Spiegel-Rösing and Derek de Solla Price, represents the most important effort to establish the boundaries and define a research agenda. Even here, the utter immensity of what is being proposed means that comprehensiveness again eludes the authors. The original plan to have each of the topics in the book include parallel essays representing what Spiegel-Rösing calls socialist and bourgeois analyses, was not achieved. Not even dealt with separately were the consideration of ethic and value questions related to science and technology, although these have been widely recognized as being of major importance (i.e.: Goldsmith; Haberer). While often referred to for supportive examples, problem-centered issues such as the "growth/no-growth debate", environment, energy, health, etc., were not given clear and separate treatment. The problem Price wrote about in 1964 remains, and is reflected in the sub-title of the book: A Cross-Disciplinary Perspective. Multidisciplinary might have been a more appropriate term. The degree of successful cross-disciplinary synthesis is minimal and interdisciplinarity is not achieved.

The volume recognizes other basic weaknesses of the field. In particular the problems of the science/technology connection and the "internalist/externalist" relationship present problems that are only recently being challenged seriously. The editors do not attempt to give a definition of the field beyond the title and the major section headings: "Social Studies of Science: The Disciplinary Perspectives" and "Science Policy Studies: The Policy Perspective" (Schmandt).

Other attempts to describe the field have been based on an examination of the institutional development of university teaching and research. In a study of 175 programmes in the United States, Ezra Heitowit of the Program on Science, Technology and Society at Cornell University, identified fourteen orientations in the STS programmes examined, with the largest representation being in Technology/Engineering, Eclectic-STS, Humanities, General/Liberal Studies, and Public Policy. He also listed the broad areas within STS Studies:

- Science, Technology and Public Policy,
- Ethical and Human Value Implications of Science and Technology,
- Science and Technology in Developing Nations,
- Technology Assessment,
- Future Studies,
- Legal Aspects of Science and Technology,
- Science, Technology and the Humanities,
- Arms Control and Peace Studies.

In an article published in Social Studies of Science, Philip D. Lowe and Michael Worboys examined "The Teaching of Social Studies of Science and Technology in British Polytechnics" and postulated five "conceptions" of Science Studies:

- Humanist "civilizing". "Science and technology are considered as cultural phenomena in their own right..."
- Responsible "...the social and moral implications of science and technology..."
- Technocratic "...to make (students) more effective agents in the coming technological age." i.e. vocational.
- Academic Principally "...history and philosophy of science..."
"...taught by historians and philosophers..."
- Reflexive "...problem-oriented interdisciplinary." "...attempt(s) to reach an understanding of science, technology and society as a totality. As such this conception of Science Studies would seem to imply a more fundamental (if not political) appraisal of science and technology."

(Lowe and Worboys)

David Edge has developed a taxonomy based on professional career aims: subject-centered and society-centered (Edge). Lowe and Worboys expressed the fear "...that the developing 'professionalism' and 'specialization' of Science Studies may result in courses and, indeed, departments that embody only one of our conceptions" (Lowe and Worboys, p. 192). Given the ambitious scope of the field and its youthfulness, compounded by the very "technologization" of knowledge that it has so convincingly documented, this concern is most realistic.

This problem must be continuously addressed. In a preparatory document for this workshop, Dr. Hooker offered a three-leveled conceptualization of the area, although with a particular focus on the question of values.

Problem Domain for Science, Technology and Human Values

| | | | | | |
|-----------|--|--|--|---|-----------------------|
| LEVEL I | (General Theory): | Theory of Personhood Humanness | Moral Philosophy (Ethics, Value Theory) | Social/ Political/ Economic Philosophy | Philosophy of Science |
| LEVEL II | (Theoretical : Tools for Assessment, Management) | Social and Economic Indicator Quality of Life Theory | Policy Analysis and Planning/ Institutional Theory | Technology/ Environmental Impact Assessment | |
| LEVEL III | (Applied Fields): | Bio-Medical Ethics | Energy Policy/ Institutional Conserver Society | Communications Technology and Society | |

He pointed out that "...one of these levels stands independently of the larger context...(and)...there is mutual interaction among the sub-domains, both horizontally and vertically..." (Hooker, pp. 1-2). 54

This is a most useful and provocative model and it has led me to think graphically about the whole STS field. The accompanying diagram is organic in appearance not just for aesthetic purposes, but to give a better sense of the conceptual processes (See Appendix I). STS Studies, ideally, should encompass all elements of the model and their interactions. Any elements or any combination of elements of the model are sub-categories of the field, and contribute to the holistic understanding being sought. Beginning (at 12:00 o'clock and reading clockwise) with the large questions concerning the nature of experience external to science and technology (1), the study of, for example: epistemology; ethics and values; psychology; social and institutional behavior; politics and management, it is seen that science and technology are important, if not the most important, shaping forces of our age (2). Thus to understand this shaping force, one must turn to (3) the study of: the epistemological and methodological characteristics of science and technology; ethics and values associated with science and technology; the psychology of scientists and technologists; the social and institutional character of scientific and technological enterprises; and the politics, policy and management aspects of science and technology. In turn, these intrinsic qualities of science and technology are shaped by external phenomena. The circle is closed (4).

If this scheme is to be of any use, it should be possible to place the work of various scholars somewhere on the circle. I believe no one has fully closed the circle in their work, and perhaps it would be too much to expect. Rather, where one begins on the continuum will determine the bias of their own work. Ellul, for instance, might be placed between 1 and 2, illustrating his inclination to look at the "great issues" and see science and technology as prime movers, although for him they remain something of a "black box". Kuhn could be placed between 2 and 3. He attempts to understand science and technology as essentially an autonomous phenomena but with characteristics that go beyond the epistemological and methodological through consideration of the social, psychological, political and management aspects of the scientific enterprise. The writings of Hessen and Bernal on the other hand, demonstrate a primary concern with science and technology as they are affected by the larger forces of the external environment.

Of course, most of the writing associated with this field could be subsumed under what Kuhn calls normal science, (or which Popper sees as mere technical busy-work) - usually one or more of the internal sub-sections of the science/technology component of this model, although increasingly including specific interfaces on the "input" and "output" sides of the science and technology component. A true "science of science" (using science in the "Popperian" sense) would only include work which makes general statements about the nature of the whole model.

It should be noted that, except for the epistemological and methodological aspects, the rest of the items displayed as intrinsic, or "internal" characteristics of science on this model, are considered as "external" in the infamous "internalist/externalist debate". And, of course, each of the sub-categories of science and technology shown could again be sub-divided - particularly politics, policy and management which includes a lengthy list of

issues and areas such as: science, technology and developing nations; technology assessment; future studies; legal aspects; arms control and peace studies from the list developed by Heitowit. To this could be added issues like environment, health, energy, etc., and interesting modes of analysis such as environmental impact assessment, resource management and modeling. Important styles of research that have been pioneered by STS practioners can cross the sub-sections including such scientometric tools as bibliometrics, network analysis and prosopographic studies. It should be emphasized that the history and philosophy of science are, in a sense, the foundational studies for the STS field. History and philosophy of science is a mature and fully professionalized area of academia with scholarship that grapples with all aspects of the model and offers the most sophisticated and sustained discussion of the issues. However, this very professionalization can present barriers to an opening to the full variety of approaches demanded by a problem area as vast as STS. In the United States and the United Kingdom the STS field has developed parallel institutions and associations although many of the most militant and effective contributors have been historians and philosophers.

Unfortunately, the lack of a coherent conception of the field, disciplinary predisposition and plain human egoism results in severe strains, with most contributors jealously defending their own bias against those who attack the problem from another point on the continuum or who combine elements in different ways. Perhaps the model offered will be helpful in emphasizing the commonality and usefulness of all contributions. More than this, however, it is presented as a challenge for researchers to approach their work with an awareness of all the elements than can be considered and caveats that should be acknowledged.¹

A final note must be made of the contradictory views that state on the one hand that STS Studies is specialization gone rampant and on the other, that this is the most liberal of fields. By concentrating on a specified area of activity - science and technology - it is true that STS Studies includes some very esoteric discussion. It does contain some of the worst or best (depending on ones point of view) examples of specialization and professionalization. The exotic terminologies of the linguists and logicians and such difficult methodologies as citation analysis and systems theory can make much of the relevant writing accessible to only very restricted, self-indulgent academic cliques. Yet for the work to have legitimacy and significance, it must at some point be seen to fit in a meaningful way into the overall scheme. While some see only the proper place in academia for this kind of activity as being at the graduate level, if not in specialized post-graduate research institutes with the researchers coming to the field with professional disciplinary preparation, others see it as one of the most exciting vehicles for a demanding, relevant and technically challenging undergraduate education. Those holding the second view also believe that the field will only realize its promise when research follows the kind of interdisciplinary educational preparation the area demands. The truth (and the problem) is that STS Studies is, and only can be, all of these things.²

II. Problems facing the development of STS Studies in Canada

The development of the STS field in Canada must overcome multiple fragmentations. First, there are the academic forms of fragmentation described by Price as being a consequence of the outgrowth from various separate disciplines, Edge and his

breakdown according to vocational orientation, the interest orientations described by Heitowit, and Lowe and Worboys with their conceptual areas. Also discussed above were the science/technology and internalist/externalist divisions.

Added to these are particular Canadian problems. As a hinterland having a particular relationship with the powerful United States metropolis, technological and academic specialization emanating from south of the border has a unique impact on Canada. Whereas industrialism based on specialized technology was a centralizing force in the United States, its spread northward into this country tends to increase decentralization within the Canadian framework to the benefit of continental scale organization with an American focus (Neil, pp. 206-207). Perhaps the arrival of scholarly techniques have the same affect on the Canadian academic community. While specialization extends the power to comprehend and control for those who originate the new techniques, those over whom control is extended (including a society such as Canada) lose the overview afforded by a strategic position at the focal point, and by adopting the specialized approaches cannot even see the pattern of their own exploitation.

"The satellite receives the last form of things first" (Neil, p. 37). The extent and nature of the frontier is defined by the newest technology and is thus dominated by that technology and those who control it from the metropolitan centre. So with scholarship the latest innovation emanating from the centre will dominate and define the new country in terms that are appropriate from the point of view of the centre but often inappropriate for the self-realization of the hinterland area.

Already existing regional separateness, perhaps originally greater than in the United States, is maintained and even reinforced. The language split is the most dramatic, although the uniqueness of the other regions are also significant. This regionalism presents well known difficulties in arriving at any national policy, and these problems are no less challenging for those interested in developing strategies for the direction and support of research.

Of course these regionalisms have a solid manifestation in the divisions of power between the federal and provincial levels of government. Whereas the federal government has been the prime initiator and supporter of the research done by university faculty, education is a provincial responsibility. This almost unnatural split works against rationalization of the two major functions of the university - research and teaching.

In addition to the academic and regional fragmentations are problems resulting from the relatively small size of the Canadian academic community. Having, generally, made an effort to model academic institutional organization along disciplinary lines prevalent in the United States, sub-disciplinary or interdisciplinary researchers must attempt to establish themselves at a time when the academic system is experiencing a real reduction of support. In many cases existing departments feel that the squeeze arrived before they were able to reach maturity, and even in the best of times they would meet developments such as the STS field with suspicion. The small number of academics who might be motivated to work in this area risk censure in their departments, and are isolated from those few colleagues that share their interests and who might offer support. This isolation can be partially alleviated by orientation to

the larger international community of scholars who are identified with the STS field. But this reinforces the disassociation from the Canadian environment discussed above and can result in a research agenda that has little to do with Canadian problems.

There is also a relative paucity of secondary literature and archival material is poorly organized. Norman Ball of the Public Archives of Canada and Sandra Guillaume, Ontario Multicultural Archives, have been active during the past few years championing the cause of archival material related to the history of Canadian science and technology. The Science Council of Canada Library has an excellent and well-organized collection of STS material, although with a natural leaning towards science policy. They also publish a weekly "new additions" newsletter with annotations. There is no union catalogue, and this should be considered.

Until recently the work done on Canadian science and technology has been predominantly of two kinds: science policy studies and "first order" history. The efforts of Senator Maurice Lamontagne through his Senate Committee and the studies by the Science Council, have generated a healthy and extensive debate on science policy issues, although this has somewhat diminished in recent years. The substantial body of literature that has been a consequence of this discussion has suffered from a fundamental weakness, which may in part explain why interest has waned - the absence of any coherent professional academic STS Studies community and thus the conceptual vacuum in which the science policy debate must take place.³ The historical data base is very thin or in many cases, non-existent. Claims are not rigorously tested by major case-studies and articulate criticism.

By "first order" history is meant historical records and accounts rather than studies - "in house" histories or memoirs, anecdotal collections or attempts to get the achievements of Canadian science and technology "on the record". These are necessary and natural first steps. In fact, they are important source materials for historical (or for that matter any) scholarship. Yet it is necessary to go beyond this level if work that has explanatory power is to be produced. As will be noted in the next section, some significant efforts are underway to alleviate this problem, and much good work is now appearing although there is a need for more support.

It is not within the scope of this paper to provide a comprehensive study of STS activities in Canada and elsewhere. However, a few observations might be useful. One of the general characteristics that distinguishes Canadian science from that in many other Western countries has been the relatively greater level of activity in the governmental sector. This same pattern is true of STS Studies. The substantial work on science policy and the few histories sponsored by governmental agencies are not balanced by independent research from the academic community or the private sector. Although the policy structures are quite sophisticated at the federal and, increasingly, the provincial levels of government, in the university and private sectors developments are minimal.

Heitowit identified 175 programmes and 2000 courses at universities and colleges in the United States. Of the 110 programmes examined in detail, 44 were primarily undergraduate, 14 primarily graduate, 38 both undergraduate and graduate, 13 research only, and one was a workshop for citizens. In the United

States, programmes tend to lean toward disciplinary and methodological "hardness" while United Kingdom programmes are more eclectic. A more careful study would be necessary to confirm this impression, but if true it would be in keeping with the periphery/centre phenomenon discussed earlier.

The "Parex" group (a combination of Paris and Sussex Universities) includes eight French and eight British university programmes. These are true Science Studies programmes and do not include history and philosophy of science departments. Lowe and Worboys surveyed eighteen programmes at the polytechnic level in the United Kingdom. There has recently been created the Science, Technology and Society Association (STSA Newsletter). There are also a number of interesting developments in Australia. The School of Science, Griffith University, inspired by the "red brick" model of Sussex University, offers undergraduate and masters degrees in Science, Technology and Society, and is developing a Science Policy Research Centre along the lines of SPRU (Science Policy Research Unit). The Open Campus Programme of the School of Humanities, Deakin University, has a "Course Team" titled Knowledge and Power producing an excellent series of teaching units under the Chairmanship of David Wade Chambers. The University of New South Wales has both undergraduate and graduate level STS programmes, and is developing a centre for research on Technology and Society. The University of Wollongong is developing an STS unit (Ronayne).

In Canada, the only degree granting STS programmes are the Institut d'Histoire et de Sociopolitique des Sciences at Université de Montréal and the Science and Human Affairs Programme at Concordia University with the first offering graduate degrees and the second only undergraduate degrees. There are history and/or philosophy of science programmes at several Canadian universities including the University of Toronto, McGill University, University of Western Ontario, University of Calgary and York University as well as individual courses in most universities across the country. It is not clear that history and philosophy of science programmes are likely to evolve into STS programmes. As often as not, the former are antagonistic to the latter.

There has not been a comparative study of the development of the STS field in Canada with other Western countries. It does seem that Canada is lagging in this area and it would be interesting to document and attempt to understand why conditions differ in this country.

III. Strategy for the development of STS research in Canada

A "...unified or interpreted evaluation across the entire domain..." cannot at this time go much beyond the kinds of heuristic models offered by Professor Hooker and myself. While these are interesting they are of limited usefulness. A more satisfactory and comprehensive model is not, however, a prerequisite for action. Rather, what is attainable are a number of recommendations related to the encouragement of a community of common interest that would bring to bear in a regular and rigorous fashion, the critical insights of those working on level one (of Dr. Hooker's model) to those on the other levels.

(i). To effect this, a Learned Society could be supported similar to the 4S group in the United States. This will be considered by many to be premature. Yet there is something of a "chicken and egg" syndrome at work here. Without an identifiable and naturally-evolved group of scholars there is no basis for an academic

society. However, it is within the Canadian tradition for scholarly societies⁵⁹ to be created on the initiative and support of federal agencies. And without such an initiative, the forces previously described may well preclude the natural evolution of a scholarly community in this new field. The Canadian Society for the History and Philosophy of Science could provide a forum for STS activities and for years there has been a militant group within the society with a particular interest in Canadian topics. Whether CSHPS could accommodate the diverse kinds of approaches subsumed under STS Studies is uncertain (Jarrell).

(ii). An inventory of Canadian programmes, courses, researchers, teaching materials, relevant governmental and private sector activities, etc., should be undertaken with the aim of identifying the potential community of interest and its resources. It would be useful to compare the state of the field in Canada to the situation in other Western countries.

(iii). Another initiative that could be taken is the creation of a Canadian STS journal. This will meet the same objections as the first suggestion and requires the same retort. In a less than fully satisfactory way, Science Forum previously served as a medium for discussion of STS issues in the Canadian context. Its recent effort to become a popular journal was commendable, but its failure has left no identifiable vehicle for scholarly dialogue about the science, technology and society relationship in English Canada. Québec Science, the magazine that Science Forum attempted to model itself after, is successful as a popular science journal but does not serve the purpose suggested above.

(iv). Support for the creation of teaching materials has been discussed for some time, but has shown little effective success. A start was made in November 1978 in Kingston at the first Conference on the Study of Canadian Science and Technology. A group with Richard Jarrell as chairman (who, along with N.R. Ball, is editor of the HSTC Bulletin: Quarterly Newsletter for the History of Science and Technology of Canada) gamely undertook the creation of an editorial committee with the aim of producing inexpensive teaching modules on Canadian science and technology. The SISCON (Science in a Social Context) project in the United Kingdom began with what its Director has called a "modest grant" of \$75,000. per year for three years. At this point the Canadian group is without support. The Science Council of Canada has recently undertaken a science education study and hopefully this will lead to some solid initiatives (Page).

(v). Grant monies designated for team research should be made available in which the applicants are required to present a thoughtful rationale that demonstrates sensitivity to the full scope of the field and the particular problems of the Canadian case.

(vi). The metropolitan/hinterland problem discussed earlier argues for a special emphasis in Canada on the broadest interdisciplinary approach. Yet to ignore the "hard" research techniques would leave us vulnerable to increased dependency at the vocational and operational levels. This is the "catch 22" that faces all smaller countries, whether at the largest social, economic or political levels, or in the area of scholarship. The balance between interdisciplinary and sub-disciplinary approaches requires cognizance of the special problems facing a small scholarly community in arriving at a satisfactory mix, and good judgement by those who might exert leadership or control resources.

(vii). At a workshop held at Concordia University in 1977, Dr. Roy MacLeod⁶⁰ who was at that time Head of the History and Social Studies of Science Programme at the University of Sussex, a member of SPRU and editor of the Journal of Social Studies of Science suggested four possible items for a Canadian STS research agenda:

- 1) Canada enjoys the possibility of doing comparisons of Anglo/French developments. A North American study of both historical and contemporary British and French science and technology is aided by the advantages of Canada's "neutral" position.
- 2) A Canadian study of American science policy would be aided by the fact that the United States is "friendly, familiar, foreign and near".
- 3) He reiterated the attractiveness for both historical and policy studies of treating Canada, or parts of Canada, as developing areas and examples of the sub-colonization phenomenon.
- 4) Case studies of particular technologies, that is, agriculture, resources, etc. would present "interesting stories" in themselves.

(Bindon and Chambers)

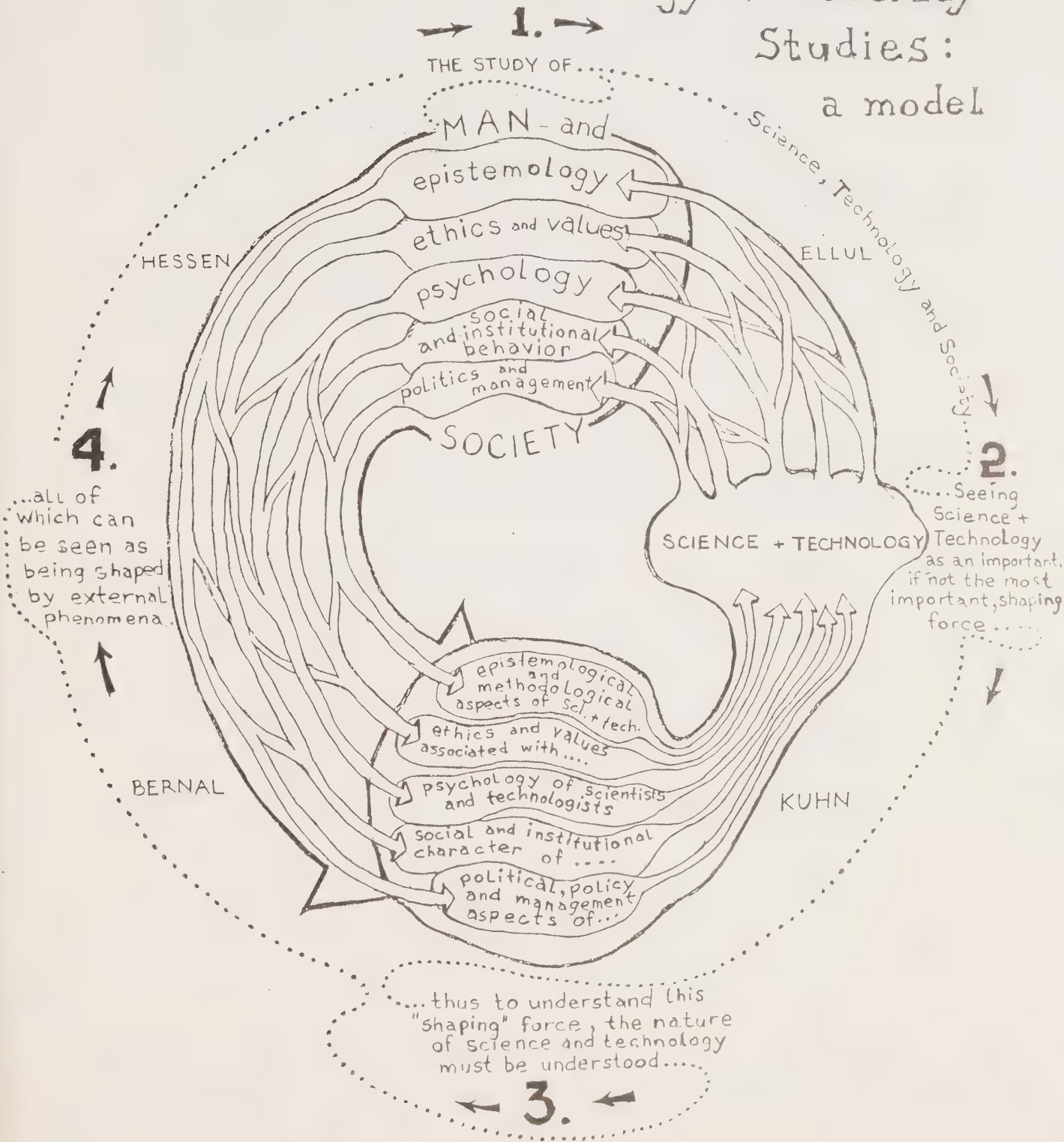
This list remains as provocative today as it was three years ago and it would be interesting and useful to add to it. This conference, and its follow-through, is a beginning.

(viii). As suggested above, some support should be offered to those librarians interested in cooperating, rationalizing and properly cataloguing holdings. It is also urgent that important materials be secured before it is too late. The "stuff" of this field is not as readily appreciated as most historical material. Laboratory equipment, tools and industrial products, engineering drawings and factory inventories - many less than fifty years old - are not of apparent significance although they may be of central importance to a researcher in the STS field.

A final thought

The litany of problems discussed in the first two sections are all but overwhelming. The forces that tend to work against the successful development of a new field such as STS Studies are so numerous, that its chances are small. Anything less than a substantial, coherent, long-term effort will risk a waste of resources and energy. The negative forces are built into the academic community at the operational level. They can only be overcome if some autonomous, overreaching agent is brought into being, and acts. The diverse and isolated individuals must be underwritten and supported for a reasonable length of time. If after a suitable period a critical mass is not reached, the undertaking should be reassessed.

Science, Technology and Society Studies: a model



FOOTNOTES

1. The model suggests the following trial definition for STS Studies:

STS Studies is the study of man and society, seeing science and technology as an important, if not the most important, shaping force of our age. Thus, to understand this shaping force the nature of science and technology must be understood, and it in turn can be seen as being shaped by external phenomena.

The closest thing I have seen to this was in an article about Parex by Vittorio de Vecchi:

A broad classification would distinguish between two classes of studies. The first, which could be described as analytical, examines the nature of science as a social institution and as an intellectual construct (two themes linked by studies in the social causation of ideas); an alternative approach bearing upon the same themes, argues from a study of society at large to an account of the type of science (public or private, elitist or popular, pure or applied - in short 'good' or 'bad') practiced by that society.

The second class, which could be called 'prescriptive', includes those studies in science policy which aim to promote science for what is perceived or portrayed as the public good, either as an immediate or ultimate good.

Ideally, the latter set of studies would rest upon a foundation formed by the former set. In practice this ideal is not fulfilled: the wealth of unresolved analytical issues presents students of science policy with a largely incomplete framework.

(de Vecchi, p. 913)

2. On the one hand the field is sub-disciplinary (i.e. sociology of science, economics of R&D, etc.), while on the other hand it is interdisciplinary. The following taxonomy of the spectrum from sub to interdisciplinary, might be useful:

sub-disciplinary: i.e.) sociology of the scientific community without any reference to any studies of science and scientists by other means.

multi-disciplinary: i.e.) the coming together of sub-disciplinary work, but with no synthesis - a sociologist studies the sociology of a particular group of scientists and a psychologist studies the same group.

trans-disciplinary: i.e.) where insights in one or two areas of study display explanatory power in another area.

interdisciplinary: True synthesis. The balanced application of as wide a selection of research modes and/or results as possible. Evidence of synthesis in which the various approaches have explanatory power in all other areas. The sum is clearly greater than its parts.

3. de Vecchi and Haberer say this is true for all science policy, but it is even more serious in Canada.

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THE IMPLICATIONS OF PHILOSOPHY OF SCIENCE FOR SCIENCE POLICY

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1. Introduction

There is a long tradition running through western philosophical thought which we shall label "formalist". Very roughly, we associate with formalism the following views:

1. All cognition is computation, the chief models being logic and geometry.
2. The formal structure of computation yields the normative structure of reason (e.g. the rules of logic) and the a priori basis for correct general empirical knowledge (e.g., the geometry of motion).
3. The world is intelligible, to the extent that it is, because it is itself a formal structure (i.e., the world is "computationally accessible").
4. The formal structure of the world is either imprinted on us piece-wise via the senses, or is knowable a priori by virtue of what the limits of computational accessibility are.

The major elements of this tradition of formalism can be traced from Plato through the Neo-Platonists, Leibniz, the Cartesians and later Rationalists, and so down to modern times.

What is less obvious, perhaps, is that the empiricist stream of thought, which has equally venerable roots, appears remarkably formalist when viewed from the vantage point of the above characterization.¹ Empiricist-Formalism, or EF for short, may be traced at least from Hobbes, Locke and other "atomists", through Hume into the early 20th century, at which time it underwent an explosive expansion because

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of the new logical formalisms furnished by Frege, Russell/Whitehead, Hilbert, and others. (Of course, there are still clear differences between rationalist and empiricist versions of formalism, especially when it comes to the limits placed on the scope of human knowledge, but these will not be explored here.) The course of twentieth century philosophy of science in particular has been dominated by the successive applications of increasingly sophisticated formal tools to EF-defined philosophical problems. Nevertheless, until the early 1960's there was little shift in the fundamental formalist strategy, however varied the formalisms employed.

Form the vantage point of this characterization of EF, the leading motifs of philosophy of science in this century take on greater significance, especially the attempts to capture philosophically important concepts in terms of formal logical structure. Such preoccupations as the attempts to explicate explanation in terms of deduction, to characterize natural laws strictly on the basis of logical form, to generate a formal inductive logic as the model of rational epistemic acceptance and method, and to represent theories as axiomatisable classes of sentences in a formally 'clarified' language, can all be seen as philosophical tasks whose value and importance rest on the underlying formalist rationale.

But what are more relevant to the focus of this paper, are the consequences of the formalist mode of thought, the philosophy of science to which it leads, and the social and political philosophy with which it is allied, for the treatment of the relationships between science, its intellectual products, and their social impact. (It is crucial to note that formalism has not evolved simply as one purely abstract model among many alternatives. It has also come to be a model which has tremendous psychological and sociological influence on the practitioners and educators of science, and on the way the social institutions that constitute science are woven into the social fabric of our culture, and into our very way of life and thinking.)

In this short paper, we attempt only to characterize in fairly broad strokes what we take to be the major characteristics of EF, and of its social and political correlate, free-market liberalism. We also trace a few of their implications for science policy and technology assessment. In passing, we outline in equally broad strokes some of the important characteristics of what we take to be one of the major alternative frameworks for viewing the epistemic activity of science, which we call the Actional-Process model, and we draw out a few of the implications of this latter view for the development of a more theoretically complete

approach to science policy and its assessment tools. As science policy is our concern here, we will begin with an examination of the epistemological roots of EF. On another occasion, we might just as easily begin with a study of free-market liberalism.

2. Empiricist-Formalism versus Actional-Process Theory

At its crudest and most general level, the following model of science emerges from the EF studies of recent years:

1. The aim of science is to maximise the number of assertions known to be true.
2. The assertions of science are expressible in the (formal) language employed in making elementary factual claims, and scientific theories are deductively axiomatised classes of elementary factual claims and logical functions thereof.
3. The method of science is to maximise the number of elementary factual claims and to accept only those theories which bear a formal logical relationship (inductive or deductive) to the data base.
4. The history of science is reconstructed as the continuous accumulation of data, and the periodic replacement of theories by more accurate and/or more general successors.
5. The choice between competing scientific theories is value-neutral; it is based on objective epistemic criteria alone.
6. All judgments as to what constitutes socially desirable ends (or socially undesirable consequences of epistemic practice) are non-cognitive: they are unverifiable or untestable (and, in the extreme, meaningless).

Within this EF model of science, more subtle dimensions of the underlying formalism can be identified. The significance of these will appear in a clearer light if we contrast them with what we will propose as the alternative "Actional-Process" framework.

EMPIRICIST-FORMALISM

1. The primary focus in epistemology is on the formal structure of the product of inquiry.
2. The epistemic agent is an ideal, abstracted individual whose epistemic behavior and decisions are rational by virtue of the formal relationships they bear to logic, on the one side, and perceptual experience on the other. This idealized abstract agent stands for no scientist in particular, and yet for all scientists in general. Rational consensus, then, emerges as a desideratum simply because epistemic activity is modelled as formal calculation and recording.
3. Normative justification is a matter of correspondence with a priori structures of reason, such structures demanding the separation of theoretical reason (as in the pursuit of truth), from practical reason (e.g., as in the pragmatic pursuit of the good). In the former, empirical factors arise only as data, while in the latter, they arise only as constraints on the possible, never as determinants of either the structure of reason or of the nature of the good.

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1. The primary focus in epistemology is on the process of inquiry as an activity.
2. Inquiry is a human activity; epistemic activity, like all human behavior, is rational by virtue of its being an attempt to solve felt human problems. Such behavior is constrained, on the one hand, by social and institutional factors within, among, and external to the human agents, and, on the other, by the biological nature of human persons. The type and degree of epistemic (i.e., actional) consensus that emerges, is a function of the range of goals being pursued, and the similarities in institutional and personal constraints affecting individual people.
3. Human inquiry, as with all behavior, reflects both the fundamental properties of human beings and the social and environmental context which constrain them and their behavior. To the extent that there are "pursuable goals" in human affairs, they reside either in the fundamental operation of the individual, or have emerged as a perhaps unintended property of the social environment which constrains his behavior. Normative appraisal, then, is either a matter of the adequate functioning of the biological organism, or of the systematic inter-relatedness of the behavior of collections of human agents. It is important to note that in both cases what the goals of "proper" or "optimal" functioning are, and how such goals are related (via "practical reason") to behavior, involves empirical investigation as well as a priori theory.

4. Science policy is a straightforward matter of maximizing the opportunity to pursue truth. All other criteria, and any restriction on epistemic activity, are "external" to science. Such external factors, though a proper object of study within science, are, epistemically speaking, either irrational or non-rational.
4. Science policy, as with any social policy, is at root a matter of extending the public good through optimal allocation of scarce resources and the control of externalities. However, the fact that the public good in this case involves the attainment of fundamental understanding, including understanding of what is basic to all human activity of any sort, makes the situation unique.

One of the important tensions between EF and the Actional-Process framework, is the latter's support of a hierarchical conception of knowledge. The resulting "system of knowledge", under this model, "ascends" from simple factual claims and empirical generalisations, through increasingly general theories, to the proto-theories which provide structure for these, and to the systematic metaphysics and normative theories which structure the cognitive set at the most general level. This last level includes canons of social, epistemic and rational appraisal, and methods of modification for the entire hierarchy. (For example, in non-relativistic particle mechanics the epistemic hierarchy includes, in ascending order: laboratory readings, force laws, Hamiltonian dynamics, space-time geometry, proto-theory of time, geometry of manifold representation, general algebra, and theories of logical structure, plus, normative theories of methodology, technology assessment, etc.)

But this epistemic hierarchy is not a fixed deductive system. The whole structure is dynamic, with characteristic timescales associated with the different levels of these hierarchies. These timescales yield rates of change of the assumptions embodied within the corresponding level, typically varying from one year or less near the bottom (e.g., for a new laboratory reading), to perhaps millenia at the highest proto-level (e.g., for successful challenges to classical logic and euclidean geometry or, at the level of normative theories, to the nature of the Good and its relationship to Truth). We note in passing that these timescales have been radically altered during the twentieth century, with those at the lower levels having lengthened due to the increased resource demands of experiment, while those at the upper levels have decreased due to increased formal sophistication, increased social interaction (in turn due to institutional development and improved systems of communication and co-operation), and our improved understanding of the epistemological hierarchical organization itself. It is no accident

that the radical critiques of the normative foundation of our way of life which have emerged in great number in recent years, have coincided with the development of these ultimately abstract theories.

Another consequence of the Actional-Process approach either ignored or denied by, among others, EF, is the emphasis on interaction both among levels within a discipline and across disciplines within a domain of inquiry. A typical example is the rejection of EF's infamous observation/theory dichotomy² and the assertion of the deep interdependence of these two products of scientific practice, but there are also less noticed, yet more fundamental interactions now receiving attention. For example, there are the interactions between domains of inquiry and the normative theories which apply to them (e.g., between physics and logic)³, and the mutual interaction between levels in "widely separated" domains. As an illustration, consider the mutual exchanges of theoretical perspectives taking place between institutional theory, operations research and general theories of methodology, or between rationality theory, ethics and neurophysiology. These phenomenon represent a rapid intensification of interactions in cognitive activity unique to the twentieth century.⁴

Part of this interaction concerns the inter-play between, on the one hand, normative theory (e.g., rationality theory, ethics), and, on the other, psycho-social and biological theories, producing such hyphenated products as socio-biology, biomedical-ethics, evolutionary-epistemology, operant theories of rationality, and so on. The same sort of interaction is taking place between normative theory and cultural theory, producing, for example, new economic models of knowledge, and behaviourist theories of the formation and dynamics of institutions.

These structural remarks regarding what the Actional-Process approach supports and EF denies, ought to undermine the hard core of EF. Indeed, the shift led by Popper, Lakatos and Kuhn to the history of science and the social processes through which these new and grander epistemic activities are to be understood, is a sign of the refocussing taking place. But even this is typically not radical enough to capture the reality of science. For example, Kuhn and Lakatos, however liberal their views relative to EF, balked at taking the final and crucial step away from formalism and towards a full blown actional epistemology. What we have tried to build into the Actional-Process framework is the recognition that, at the most basic level, inquiry is a social activity undertaken by human agents. Only for restricted,

though nonetheless important, purposes it is legitimate to focus solely on the abstract product of that activity.⁵

Of course, the decision to build epistemology around the core concept of human action brings with it a new set of problems. Perhaps foremost among these is the problem of how action undertaken as part of the process of inquiry is to be characterized as "rational". The general position we adopt is that individual human choices (motivated by whatever desires and beliefs the individual may have) are the rock bottom of epistemology, just as they are the rock bottom of social ethics, aesthetics, and every other human activity. What this position must argue is that the underlying "logic" of choice or action, whatever it turns out to be, is the same in all cases. What makes each of these activities different, therefore, must reside in the social or biological determinants of the large range of behavior which constitutes the activity in question.

For example, one might hold that what ultimately characterizes science is not its method, treated by EF as a set of abstract rules, but rather its institutionalized processes, including the way it shapes individuals' values, its modes of communication, its reward structures, etc. (Under this model, the traditional "lone seeker after Truth" becomes a somewhat degenerate special case, if only because science requires criticism, criticism involves language, and language is a communal cognitive skill.)

Under this model, therefore, individual choice behavior remains basic, but choice behavior is seen as taking place in a dynamically active social environment. Thus, one of the important problems for epistemology becomes understanding how that environment changes, and how inquiry both influences, and is influenced by, those changes.⁶

One of the normative roots of EF is the fear that if a significant measure of the rationale for individual epistemic activity resides in a dynamic environment, then what counts as inquiry can change as that environment changes. In contrast, we embrace this conclusion, and judge it to be a good thing that human beings are collectively exploring new notions of inquiry. The social and individual processes that comprise 20th century science are quite different from their 17th century counterparts. Scientists have different sorts of values and epistemic roles, partly because the institutional structure of the scientific community is different, but also partly because there is abroad now a different conception of the role of inquiry in the society. As a result, 20th century scientists are different sorts of

people than their earlier colleagues, and no adequate account of the process of scientific inquiry can ignore this fact.

Perhaps the deepest fear motivating the EF quest for an individualistic, a priori model of inquiry, is that unless some such foundation can be found, we must face the fact that what we all take to be some of the most ennobling creations of the human intellect, and some of the most humanizing forms of behavior (we refer to scientific theories and intellectual inquiry respectively) are neither pre-ordained for man, nor a necessary part of the make-up of the universe. We join the formalist in fearing the extinction of what is humane and ennobling, but wonder whether the best way to prevent this might not be to recognize its fragile dependence on the peculiar forms of social life that have evolved in the all too recent past. Perhaps only then can the true threats to its existence be identified and disarmed.

The Actional-Process re-orientation, then, raises three specific sorts of problems for a theory of inquiry, plus some second level problems concerning the interactions among the three. The specific problems are: First, what is the logic of individual action? Second, what are the social organizations and processes that at present give rise to, encourage, and maintain the individual epistemic activity that collectively generates what we know as science? Third, what are the biological and/or basic psychological processes that provide the underpinning to the epistemic activity of the individual, and to the social forms of interaction on which that activity depends.

At the second level, the most important questions would seem to be the following:

1. How do the biological or basic-psychological processes of learning, thought, and action, interact with the logic of individually rational choice? (Note that the interaction may go both ways. We may, for example, be unable even to identify biological functions within the organism without some sort of normative model of behavior.)
2. How does the social environment, provided by the activities of past generations of scientists and present institutional structures, interact with individuals to produce the social enterprise of science?
3. How does the social environment that makes inquiry possible change as a result of individual choice behavior? Does its manner of change simply reflect other institutionalised parameters of the social activity?

4. How are epistemic norms extracted from this collective activity and what is their nature? What is their role in guiding the adaptability of the collective level to changes produced by individual behavior? Is the model of choice generated by the defenders of epistemic utility a valid codification of present scientific norms?
5. How is novelty produced in this system? Is it simply the result of individual coping behavior within the sometimes loose constraints of the social and biological environments? What is the role of the deliberate generation of, and resolution of, conflict?

Of course, these and other problems of interaction within the three pronged approach of the Actional-Process model will take many years to come into clear focus. Some problems might force a re-examination of traditional formalist questions, but even so the point of the investigation will have changed.⁷ In this regard, it is important to note that with the Actional-Process framework comes the recognition that a theory of inquiry is not simply, in formalist terms, a proposal concerning what ought to be, but is also a characterization of what it is to be a human being, and of the games that we are both doomed, and blessed, to be playing.

3. Empiricist-Formalism, Liberalism and Policy

The contract between the EF framework and the Actional-Process approach, and the degree to which traditional philosophical problems become recast by the latter, could be explored at great length. What is of specific concern to us here, is the manner in which this re-orientation sheds light on traditional models of the appraisal of science policy and technology.

As indicated in our brief characterization, for EF the relation between scientific methodology and science policy is clear and forthright: There is simply no relation of any theoretical significance. With method characterized solely by formal logics, and with policy construed as simply a matter of practical prudence, how could there be any theoretical relation between them? On epistemic grounds science policy should recognize the supreme, objective, cognitive superiority of science and scientific method, and should accord scientists total internal autonomy over their affairs. At a somewhat more abstract level, the relations exhibited among persons engaged in science is seen as providing the general model for a free and intellectually honest society.

These were the terms in which early logical positivism opposed in the development of Nazi science. They were also the terms in which Popper (essentially empiricist that he is) opposed both Platonism and Marxism. They are still the terms in which state interference in scientific research is opposed throughout the Western world.

But such a theory of the methodology/policy relation cannot provide an adequate model for the societal support of science, other than the trivial one of stipulating that support should be a function of each individual's peer-judged ability to use scientific methods. Sadly, this is the very (quasi-) system of funding which has dominated the support of science from the nineteenth century, when the fight was to establish science as having a right to be supported at all, to the present post-war era, when the inadequacies of the approach are only beginning to be recognized. However inadequate, an alternative has yet to be found. Government funding still sticks to a peer-judged, individual-merit formula, albeit within an increasingly elaborate framework of bureaucratic programmes.

Why no acceptable substitute has surfaced can best be seen by turning to the other half of the philosophical spectrum, and an examination of EF's counterpart in the social and political sphere — free-market liberalism. Where science policy is constrained by an inadequate conception of science, it is entirely emasculated by an improverished conception of public policy in general.

The fundamental properties of liberalism have been clearly expressed by Roberto Unger, who argues, as do we, for the deep connection between liberalism and the empiricist conception of knowledge, value and reason. The dovetailing of liberalism and the empiricist-formalism can be exhibited as in Diagram 1. (See also Macpherson (31) and Tribe (39).) We explore here only one of the lines of thought suggested by this diagram for the nature of public policy.

Very briefly, Unger suggests that there are five dichotomies which lie at the heart of all Western philosophy; corresponding to each is a fundamental antinomy. The first and basic dichotomy is formed between the universal and the particular: The former is formal, abstract, constant, general and partial; the latter is substantial, concrete, variable, individual and complete. The other dichotomies are derivative: understanding vs. experience, theory vs. fact, reason vs. desire, rules vs. values. In each case, the former lies on the universal side, the latter on the particular. The antinomies corresponding to these dichotomies derive from two simple constraints: 1. Since the dichotomies are absolutely fundamental distinctions, they transcend all

PERSONS

1. PERSONS ARE EMPIRICAL COPIERS + COMPUTERS, DRIVEN BY DESIRES
 2. DESIRES, PERCEPTIONS ARE PRIVATE AND OPAQUE TO REASON
 3. RATIONAL ACTION IS INDIVIDUAL AND UTILITY-MAXIMAL
- LANGUAGE
4. COGNITIVELY MEANINGFUL LANGUAGE EXHAUSTED BY PERCEPTUAL REPORTS ⊗ LOGIC
 5. REMAINING LANGUAGE, AND BEHAVIOUR GIVEN CAUSAL EXPLANATION (ONLY)
 6. PRIMARY REFERENCE OF COGNITIVELY MEANINGFUL LANGUAGE IS WHAT IS GIVEN

VALUE

EPISTEMOLOGY

- 7'. NO OBJECTIVE VALUES
- 8'. INDIVIDUAL VALUES ARE PRIVATE UTILITIES
- 9'. PUBLIC VALUES ARE CONVENTIONAL OR FOLLOW FROM 3.
7. KNOWLEDGE IS ULTIMATELY UNIFIED
8. COGNITIVELY MEANINGFUL CLAIMS DIVISIBLE INTO ANALYTIC-A, PRIORI AND EMPIRICAL-A, POSTERIORI
9. EMPIRICAL CLAIMS ARE VERIFIABLE (FALSIFIABLE, CONFIRMABLE) AND COMPUTATIONAL.
10. THE EPISTEMIC SUPERIORITY OF SCIENCE LIES IN ITS RESTRICTION OF METHOD TO 7, 8, 10; LEADING TO UNIQUE HISTORICAL PROGRESS

METAPHYSICS

- 10'. SOCIAL STRUCTURES ARE REDUCIBLE TO RELATIONS AMONG INDIVIDUALS
- 11'. SOCIAL RELATIONS ARE CONVENTIONAL
- 12'. ALTERNATIVE SOCIAL CONCEPTS ARE CONVENTIONAL (LAWS) OR FOLLOW FROM 3.
11. WORLD IS CONCEPTUALLY SIMPLE, COMPUTATIONALLY ACCESSIBLE, GIVEN

LIBERALISM

EMPIRICISM

POLITICAL ECONOMY

- 13'. FREEDOM IS THE MEASURE OF THE CAPACITY TO SATISFY DESIRE.
- 14'. SOCIAL INSTITUTIONS ARE EXPLAINED/JUSTIFIED BY INCREASE IN FREEDOM
- 15'. EXPLANATORY/NORMATIVE POLITICAL THEORY IS THAT OF SOCIAL CONTRACT
- 16'. THE MOST EFFICIENT SOLUTION TO SOCIAL COORDINATION AND CONFLICT RESOLUTION GAMES IS THE ECONOMIC MARKET
- 17'. BASIC INSTITUTIONS (MARKET, ARMED FORCES ETC.) ARE PARETO OPTIMAL
- 18'. OTHER INSTITUTIONS HAVE POSITIVE COST/BENEFIT OUTCOMES FOR DOMINANT COALITIONS (HENCE DERIVATIVELY PARETO OPTIMAL)

ETHICS

- 19'. CHIEF ETHICAL PRINCIPLE IS UTILITARIANISM
- 20'. ECONOMIC MARKET \Rightarrow ETHICAL ACTION IS RATIONAL
- 21'. SUPPORT OF THE MARKET IS UNIVERSALLY OBLIGATORY
12. METHOD IS INDIVIDUALLY OPTIMAL
13. EACH SCIENTIST OUGHT TO OPTIMISE HIS OWN KNOWLEDGE CONTROL BY FREE CHOICE OF ENQUIRY PATH
14. SCIENTIFIC INSTITUTIONS ARE JUSTIFIED BY THE INCREASES IN KNOWLEDGE/CONTROL THEY YIELD FOR INDIVIDUAL SCIENTISTS
15. THE MOST EFFICIENT SCIENTIFIC INSTITUTION IS THE "FREE MARKET OF IDEAS"
16. SYSTEM OF SCIENTIFIC ETHICS GENERATED BY SUPPORT OF "FREE MARKET OF IDEAS" AS MEANS OF OPTIMAL INDIVIDUAL PURSUIT OF TRUTH.

thought built on their foundation. It is conceptually impossible to collapse them, and so it is necessary to assert the separability, in each case, of one side from the other. 2. Each dichotomy ultimately proves impossible to uphold both in the light of empirical theory, and on conceptual grounds. In the end, facts must be construed as dependent on theory, and vice versa; reason as dependent on desire, and vice versa; etc.

On Unger's characterization, in all cases liberalism and empiricism choose the latter, particular side of the dichotomy, and relegate to inferior status the universal, theoretical sides. As an outgrowth, in liberalism-dominated societies, all public "policy", science policy included, can only be viewed as an inherently political reaction to (a) pressure from special interest groups and (b) the 'externalities' of economic activity. Therefore, it can be at most prudentially rational, never epistemically rational. (As it happens this dichotomy also applies to the bulk of the literature on the subject: On the one hand there are conceptual and empirical analyses of political power; on the other, there are supposedly "objective" measures of the efficiency of specific policy actions relative to their stated, usually economic, objectives.)

This state of affairs mirrors the philosophical treatment in both EF and liberalism of facts and values. Because of the theory/fact dichotomy, the former conception restricts policy "sciences" to the analysis of particular, non-theoretical, measurable consequences. Because of the reason/desire dichotomy, the latter conception restricts the normative component of policy, by necessity, to what can only be treated as the non-rational and subjective desires of "special interest" groups or individuals.

It would take us too far afield to examine in detail all of the more specific influences of the liberal/empiricist doctrine on the practice of policy formation. By way of illustration we consider the development (or lack of it) of Canadian science policy and the relationship between social indicators and technology assessment.

Until very recently, science policy was non-existent in Canada; what activity there was had been fragmented among various government agencies and hidden under other labels. Jackson encapsulates the relevant institutional development in this way:

The idea that there might be a need for science policy probably first arose among scientists, who felt they alone understood the great potential value of their work,... Wartime helped to convince politicians that it was so, and thus one theme behind the establishment of structures for science policy was set in motion in 1916 in Canada, with the formation of the Honorary Council for Scientific and Industrial Research. This came to be called the National Research Council. Later another theme entered and was beginning to be heard by the time the Glassco Commission on Government Organization made its recommendations for new science policy structures in 1963. (Canada, Royal Commission on Government Organization, Chairman, J. Grant Glassco, Information Canada, Ottawa, 1963.) This theme was a concern that science and technology were bringing about massive changes in the society, were calling for massive expenditures, and needed to be brought under some form of social control. Thus both themes were in evidence through the period of formation of the Science Secretariat of the Privy Council Office (1965), the Science Council of Canada (1966), and the Ministry of State for Science and Technology (1971).

In short, technical funding of "hard" science research projects aside, all the relevant science policy structures date from after 1965. Moreover, it was not until 1968 that any explicit attempt was made to discuss a national science policy, and then only a very general and fragmentary description occurred. It is only in the last 5 years that a variety of statements and activities have evidenced the beginnings of a more complex approach to Canadian cognitive institutions. For all intents and purposes, there is still not today in Canada a recognisable, coherent, comprehensive science policy.⁸

Turning to social indicators, the general term now includes everything from purely economic measures to scattered attempts to measure the "quality of life". However, the base notion of an "indicator" is still constrained by the underlying economic model. Such extensions as have been introduced, usually in response to the unavoidable appearance of "externalities" whenever social action is undertaken, rarely depart from being attempted codifications of what is assumed to be objective, empirical information. Normative content is excluded on the grounds of the liberal-empiricist tenet that such matters are subjective. (A typical example is provided by the Economic Council of Canada's attempt to

provide objective social indicators to evaluate the educational process.⁹ Everything of subtlety, and of educational importance, escapes between the cracks. In Canada, at least, the normative dimensions and theoretical subtlety of constructing social indicators are just beginning to be noticed.¹⁰⁾

Of course, this conception of social indicators conforms perfectly with what is needed by the prediction-oriented approach to technology assessment. It, too, is conceived along the value-neutral, economic analysis lines of liberal-empiricism.¹¹ In contrast, the Actional-Process epistemology sketched earlier, leads naturally to the view that such assessment, and policy generation itself, whether science policy, economic policy or social policy, only makes sense within the framework provided by a structured set of goals — a "normative vision" if you like. But lest we fall too quickly into the opposite trap to that which snared liberal-empiricism, this "vision" must clearly be fundamentally different from a universal, theoretical, and rationalistic "ideal". Normative matters must enter into the design of social policy, but we cannot simply stipulate a utopian model towards which all policy is directed. The sad history of past attempts to stop all unwanted change and to assume total control over social evolution should alone convince us of this much.

4. The Actional-Process Vision

In rejecting EF, the Actional-Process framework for philosophy of science makes the following interdependent structural changes to the traditional view:

1. Science is systematic, not linear.
2. Science is, in an important sense, process, not exclusively product.
3. Science is normative, not value neutral.
4. Science is individual action in a socio-historical context, not isolatable epistemic-acceptance.
5. Science is developmental, not a priori.

The corresponding claims in the area of social policy would be:

1. All social policy affects the entire social system.
2. The generation and implementation of social policy are themselves a part of a dynamic, evolving structure.
3. Choice of social policy logically depends on a normative vision of the Good.
4. The implementation of all social policy involves the co-ordination of individual behavior in its full socio-historical context.

5. No social policy is justifiable a priori.

From what we have said above, the linkage between these two sets of claims is clear. Since science is fundamentally an institutional social process, involving the co-ordination of behavior in the pursuit of valuable knowledge, it provides a ready model for the structure which all social policy must take. The extent to which a particular policy is effective, depends on the extent to which it takes these institutional processes into account.

Among the implications of this parallel, three in particular are worth drawing out in more detail.¹²

1. Since policy is normative, and involves the co-ordination of behavior, a completely specified policy in any area must include a description of ends, as well as means. Choice of policy is always a function of available techniques of communication and persuasion, and of existing institutional structures through which behavior is molded, but it is also a function of what the ideal is towards which society is moving. In this sense, although institutional structures and forms of technology are what make any social policy possible, and therefore often provide the locus for fundamental social change, it is the normative selection of ends which determines which technologies and structures ought to be developed.¹³
2. Since the policy maker and the institutions of implementation are both integral parts of the dynamic social system which would be altered by any envisioned policy, and since no policy is a priori justifiable, all policy, and all normative visions towards which policy is directed, represent at most a particular phase in the evolution of a form of social life. Moreover, once we are equipped with this understanding, the choice of a directing vision for policy becomes a matter of the conscious selection of such a form of social life. But by virtue of the contingent nature of all such choices, that selection must be recognized as an inescapably constrained, or "local" choice, whereas the problems with which it deals are inherently "global". Therefore, there is in principle a fundamental uncertainty regarding all social policy. Policy is always chosen and implemented in a socio-historical context. But the events which constitute the evolution of a form of social life and of its normative visions, are necessarily beyond the control of that form of life. Moreover, if the formalist conception

of a "totally computationally accessible" universe is rejected, no form of social life, and no form of understanding can capture all the events which will influence their own evolution. Needless to add, the institutions through which a form of social life deals with this fundamental uncertainty of policy choice are typically among its most central (e.g. The institutions which maintain the metaphysical orientation of a culture).

3. With the normative vision accepted, in this way, as itself simply an intervening variable, the broader focus for all policy becomes the selection of processes for change within the constraint of fundamental uncertainty. Given this, the only possible vector of development is that of constrained increase in "understanding", taken in its broadest sense.

At the most abstract level, therefore, the form of "understanding" which is of relevance to policy is the understanding of the evolutionary nature of normative visions. In present-day science, the normative vision of universal, objective truth has been institutionalized, in the sense that individual behavior is manipulable in keeping with this vision and supporting policies are implementable. But that vision has never been placed in a broader context provided by an appreciation of the evolutionary status of the vision itself. The evolutionary status of all products of the activity is coming to be recognized, but the vision that lies behind the institution, that guides the behavior, that gives rise to these products, is still seen as fixed. This is why present-day attempts to place the pursuit of objective truth in the broader social context can only be effective if the evolutionary status of science's normative vision is itself given institutional expression. The next step would be to give institutional expression to the view that all social policy, all technology, and all normative visions on which they may be based, are necessarily evolutionary.

Out of this whole discussion, therefore, comes the conclusion that, as with other policy areas, fundamental science policy is that which is directed towards "education" in its fullest sense. Particular policy choices, such as, for example, between a research policy supporting Recombinant-DNA research, and one supporting renewable energy research, can only be made in the light of a selection of what form of life is worth pursuing, what forms of understanding are involved, and what technologies are required. This choice should only be made with the full acceptance of the fact that no set of institutions, no technology and no form of life, can eliminate novelty and avert change. In other words, and returning to our main theme, we must live with Unger's

antinomies, and we can do so either by embracing them, or by pretending they don't exist. But choosing the former places us on the razor's edge: The comfortable dogma of universal-absolutism on one side, and the soothing oblivion of solipsistic-nihilism on the other. There is, of course, no completely satisfactory reason to remain perched between the two, but it would seem that we have no choice, either.

5. Conclusion

In the last 20 years, the failures and inadequacies of liberal-empiricism have become increasingly obvious. On the epistemological side, the practical interrelatedness of scientific and social change, and of scientific theory and its institutional organization, have become so obvious that theoreticians can no longer claim to be able to capture the essence of science in formal logics.¹⁴ Once that quest is forsaken, the edifice of empiricist-formalism is shaken to its very foundation.

On the social and political side, our technical mastery of skills with which we can produce change has far outstripped the meager ability of our liberal institutions to direct and control that change. We are in the unprecedented position of being able to invent and apply on a global scale entirely new technologies within a single generation, and yet we are shackled with a political and social ideology which is logically incapable of making any judgment as to whether the implications of our actions are good or bad.

There is an urgent need for the development of the intellectual tools and the corresponding institutional structures capable of handling the assessment and management of our increasingly complex technologies, including the 'soft' institutional technologies for the societal pursuit of science, and the problems to which they give rise. Perhaps foremost among our many needs, is the need for an understanding of human knowledge that sees it for the value-laden social artifact it is, and not as the shadow of divine truth which past theories have made it out to be. With this will come the recognition that, in the broader pursuit of valuable understanding, present-day science is as constrained by its own ideology of empiricist-formalism, as, in the broader attempt to create worthwhile forms of social life, present Western society is by its ideology of free-market liberalism.¹⁵ Only when this theoretical linkage between a culture's social policies and its model of science is acknowledged and put into practice, can the real problems of human social existence be tackled, and its real blessings be counted.

1. For a discussion of the empiricist-formalist framework see e.g. Hooker 19, Unger 42. For discussions of some aspects of the actional-process framework, see Hooker 20 and in particular Bjerring/Hooker 3,4. The opening section of Bjerring/Hooker 4 contains an earlier formulation of the positions developed here, the papers then go on to focus on different aspects of the problem.
2. Note that this interaction may go both ways, observations may be used to form and criticize laws, but theoretically organized laws may equally be used to form and criticize observations, cf. the discussion in Hooker 19. This two way interaction is of the essence for understanding the basis of naturalistic theory of scientific norms as themselves theoretical conjectures. See the discussion in Hooker 20.
3. See e.g. Hooker 23, 24.
4. Among the many contributing causes of this phenomenon, we would suggest that the following are particularly revealing: (i) Our new found appreciation of the hierarchical nature of knowledge; (ii) our rapidly expanding command of energy and technology; (iii) our expanding knowledge of ourselves as knowers and actors, especially the development of theories of our own (pre-) selection processes (decision theory, control theory, institutional theory, etc.); (iv) the intensification of the scale and pace of cognitive change which has focussed attention on its institutional mediation and the importance of normative-descriptive interactions. These matters are discussed in more detail in Hooker 21; cf. also Bjerring/Hooker 3.
5. There are of course the criticisms of Feyerabend, cf. e.g. 11 and the critical review in 17, despite the absence of a clear motivating theoretical framework. A nicer approach to the case is that of Brown, 5, backing for which may be found in the references cited in notes 1 and 4.

As to science policy and its associated cognitive and normative tools, a review and assessment of research activities in all of these areas, in Canada, is presently being directed by one of us (C.A.H.) on behalf of the Social Sciences and Humanities Research Council of Canada. Some twenty position papers are to be prepared and evaluated on these issues, leading to a final report to Council, which will be subsequently printed and publicly released. Copies may be obtained after January 1, 1980 by writing directly to Mr. Allan Fox, SSHRC, 255 Albert St., P.O. Box 1610, Ottawa, Ontario, K1P 6G4.

6. Further discussion of intermediary problems can be found in Bjerring/Hooker 3,4, see also Bjerring 2 and Hooker 18.
7. Of particular importance could be the recognition that the motivation for re-asking the formalist questions resides in an empirical/normative nexus of inter-related concerns, beliefs and theories. To that extent, the criteria by which a proposed problem and its solution are evaluated include, in principle, descriptive adequacy, logical coherence, and evaluative relevance.
8. For government statements on science policy see, for example, Science Council of Canada, Report #4, Towards a National Science Policy in Canada, Ottawa, Queen's Printer, 1968., Report #6 A Policy for Scientific and Technical Information Dissemination 1972, Report #18, Policy Objectives for Basic Research in Canada, 1972, Issues in Canadian Science Policy, Jackson 26.

Recently, people have begun to talk about the institutional management of epistemic activities, e.g. Chevalier/Burns 8, Livingstone/Mason 29, Wojciechowski 45, as well as in Leiss 28. And others have begun to raise the question of the relation of world views to theories of policy management tools, e.g. Tester and Others in Mykes 35 and various papers provided to SSHRC (note 5).
9. See the discussion in Hooker 22.
10. See e.g. the remarks by Bruseguard 6,7, currently Chief, Social Indicators Unit, Statistics Canada, cf. papers in Mykes 35.
11. Two of the most recent and influential documents are those of Demirdache 9 and Gibbons/Voyer 13 - contrast Lang 27 (and other papers in the same volume) and Tribe 41 in general. Against many of the papers of the fledgling social impact assessment movement in Canada - see Mykes 35 - one might contrast Lovins 31 and the papers in Leiss 28 and Nelson/Gray 36.
12. As a rough orientation for this approach, and as an introduction to related matters, consider Lowe's model of economic knowledge (as opposed, for example, to both Rosenberg's and Hollis/Nell's), enriched by Vicker's conception of Lovins' retrospective policy analysis. (See 39, 16,43,44,30 respectively)
13. See e.g. Hooker/van Hulst 25, Leiss 28, Lovins 30.
14. The literature on these issues is vast; some of it is reviewed in Hooker 18. Theoretical positions range all the way from Radnitzky 38 through Barnes 1, and Easlea 10 to Foucault 12.
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SCIENCE, TECHNOLOGY AND HUMAN VALUES: A COUNTER-PROPOSAL.

Jean-Claude Guédon

Editorial note: Unhappily, the promised revised version of Professor Guédon's paper did not arrive at printing time. Rather than lose Guédon's contribution, the original paper, slightly condensed, has been included here. (Condensation, to save space, affects sections I, II para. 2 and III para. 1 only.)

Prologue: Out of decency to my colleagues from the United States, I have decided to write this brief essay in English. Accordingly, I have endeavored to use American spelling practices. My Canadian colleagues, of course, should either know French or bear the consequences of their ignorance.

I

Introduction.

We are confronted here by a broad but fuzzy question. If I understand correctly the circular I received at the end of September (Annex 1), we should assess research priorities in science and technologies as they relate to the general question of human values. Through a process of elimination I had to assume that priorities in science and technology had to be subordinated in some fashion to human values.

II

Assessing the proposed framework of discussion

The three-level diagram of the September circular offers ample opportunity for exegesis, but I do not intend to waste too much time on it. I will simply note that if you read it according to English or French usage (from top to bottom, from left to right), you move in some undefined fashion from a theory of personhood and humanness (top left) to communications technology and society (bottom right). The transition stage of level II is perhaps the most interesting of all as it displays concern for assessment and management. How we move from the theme title of this meeting to management remains a mystery, but there it is. It is highly significant, at any rate, that management concerns should appear in this context, but more of this later.

Moving down from Level I to Level III makes me wonder what the meaning of these levels is and why these kinds of levels should appear and not others. In a house, for example, the floors relate to each other in a constant fashion. But with respect to the diagram, it is very difficult to establish the legitimacy of any level introduced, especially if their mutual relationships are scrutinized. If one assumes that Level I is supposed to inform Level II which, in turn, informs Level III, it seems clear, from the outset, that Level I does not inform Level II in the same fashion that Level II informs Level III. With respect to Level II, Level I can stand only as implicit or explicit assumptions, or as deontological imperatives, while Level II is supposed to be theoretical knowledge of some sort which, as all theoretical knowledge is problem oriented rather than object oriented, but which can also be focused on some concrete object or situation and, ipso facto, be transformed into applied knowledge. It is as if the second floor of a house does support the third, but it itself hangs up in mid-air (by the simple virtue, I suppose, of the exhortations of the well-wishers watching this interesting feat).

The diagram of the September circular can be criticized in yet another way. It leads the reader from a "theory of personhood" to "communication technology and society". If we skip the details cluttering the space between these two antipodes, one important element remains: implicitly, this diagram takes for granted that some ultimate theory of human nature is necessary to approach the question of science and technology in society. And why not? After all, most social thinkers of the eighteenth century founded their analyses on some definition of man and it lead them a fair way: Likewise, classical economics is based on some ideal vision of man or homo economicus. Marx notwithstanding, homo economicus is still very much alive and well within the economic textbooks of our time. And I must confess that my personal tastes and my affection for the eighteenth century make me look upon such notions with emotion in my heart. After all, it is an immense privilege for a historian like myself to encounter live remnants of past intellectual debates. But this said, their ability to survive up to the present day does not convince me of their validity. On the contrary, their survival constitutes the best proof that urgent work is needed to put a stop to this kind of approach since it ends up masking realities rather than contributing to our collective enlightenment.

In short, I submit that the present meeting is organized on wholly unacceptable premises and that pursuing our discussions within the proposed framework is to make oneself the willing instrument of prevailing ideologies. And there is something worse: if we do engage in discussions along the proposed lines of the September circular, we shall be neatly exploited in the following manner: the powers-that-be shall focus on the fact that a formal consultation took place to legitimize whatever decision they endorse.

At the same time, I do not intend to storm out of this meeting because my feelings are that the proposed framework of analysis emerged much more as the consequence of hasty thinking than as the goal of malicious intent. Besides, it is still time, perhaps, to raise much more fruitful questions which could guide our discussions.

III

A square look at scientific and technical activities

Approaching science as knowledge and evaluating the nature of this knowledge with respects to notions such as truth or reality produces only extremely limited results. Scientists, are rarely impressed. I would submit that philosophers starting from an abstract conception of Man and of the knowledge of which He is capable have very little to say that is interesting; they are very much in the situation of Diderot facing the governing practices of Catherine II of Russia: they can fret, write and exhort, but they scratch only paper and not human skin! In the end, they are lucky if they can sell their personal library to the Empress in order to survive.

Science, and a fortiori technology, are activities first and foremost. In the general division of labor characterizing our industrial societies, room has progressively been conquered by new kinds of men or new roles. As time flowed, their names

changed and they did not remain the natural philosophers they once were. Now they are called scientists and engineers. Furthermore, Althusser and his followers have made the important point that "science" does not exist; only particular sciences do. To talk about science is to fall prey to an illusion or to perpetrate the same on someone else.

There remains the question of the family of sciences. Why each particular science (including "food science" to take one of the latest entries into the scientific game) should want to move into the great scientific family is a complex problem which I shall not broach here, but this phenomenon is clearly related to the fact that the sciences have collectively appropriated the right to speak with authority and have established such power relations with other segments of society as to make their authority stick. Incidentally, we can already note that it is this same authoritative (or authoritarian?) status of science which makes the task of assessing research priorities very problematic. Why should scientists listen to us in particular, or to others? What power can we rely on to insure that they pay attention to us?

To return to our present analysis, it would not be fair to say that scientists form corporate entities entering into specific social relationships with other social entities such as various institutions. Internally, these scientific corporations are hierarchically structured according to rules which have kept sociologists busy for the last twenty-five years or so (Merton in the States, for example, and Bourdieu in France). Very complex systems of power relations structure scientific and technical activities. Sometimes, individuals are the objects of these relations (cf. Crick's and Watson's account of their discovery of the structure of D.N.A.); sometimes institutions are involved, or whole disciplines. In short, scientific activities exhibit macro and micro-phenomena which, moreover, are mutually related in shifting and complicated ways varying from sector to sector. Now, if we keep our eyes focused on this complex society within a society, if we keep in mind the intrinsic violence of its internal mores and the intricate defenses it throws up in order to maximize its global autonomy and its influence on the rest of society, then new questions come to mind while the gently ethereal atmosphere of the "problem domain" of the circular becomes both unreal and ludicrous in comparison with the real world of science, or rather of the sciences. It is to these new kinds of questions that I would like to turn now.

IV

Toward a new distribution of scientific knowledge and power

At present, it is clear that scientists push this or that research project largely to respond to career demands and institutional pressures. They constantly use a language adapted to the situation they face. To the outside world, they claim that, sooner or later, their work will be useful and that, in the meanwhile they know best how to manage their research. To themselves, they talk theory, and practice institutional control, since these particular elements constitute the main currencies of their own corporate world.

Now, suppose the world outside science decides that utility is no longer sufficient, that "values" must also inform scientific activities of all sorts. For one thing, it is obvious that the world outside science will face enormous difficulties in reducing its own cacophony into a relatively clear message to the scientists. Then it is more than probable that the scientific community (or communities) will add ethics and values to its discourse aimed at the outside world while keeping on doing what it does inside. I would even bet that scientists can even anticipate the outside world and proceed to draft themselves some deontological code, acting on the principle that it is safer to draw your own constraints than to let outsiders do it for you. I would further argue that if we push our discussions along the lines suggested by the September circular, we will have a small chance to participate in the elaboration of this monument elevated in the name of good intentions. Do-gooders may find this inspirational, but, personally, I think it will all turn into a worthless farce. And scientists will listen only to the extent that they will find it expedient to exploit our idealistic ruminations for their own benefits.

Does this mean that we must remain powerless and silent? I think not. And I find cause for moderate optimism in the following facts. If indeed the sciences have managed to build themselves a power base by succeeding in providing the scientific discourses with an aura of authority, then it becomes interesting to examine how this scientific knowledge is produced, and even more importantly, how it diffuses and how it is appropriated. It then becomes clear that scientific knowledge is essentially produced and appropriated by scientists and engineers themselves and that it serves only a tiny fraction of the whole population. Not only that, but the technicalities and difficulties inherent in the scientific discourse constitute as many justifications for the emergence of this new brand of sorcerer called the scientific expert. As a result, the very nature of science as scientists project it to the outside world leads to the belief that decision making where scientific matters are involved must include those in the know and them alone. And so far, all those who have made use of those in the know, with very few exceptions, are people connected with powerful institutions, such as branches of the government, large industrial corporations, and the like. To put it bluntly, workers have rarely if ever made use of science, even when they benefitted from the support of powerful unions. And, on the whole, few scientists have raised objections to this situation and even fewer have taken steps to try and correct it. But this is quite comprehensible when one stops and thinks that the power of science has always been linked with more traditional forms of power.

Now, if we are really serious about changing the ways in which science is being appropriated and used, then it might be useful to think about new patterns for the productions, diffusion and appropriation of science. I realize this is a tiny step, but it might have some importance if we can also root this theoretical effort into existing organizations. Let me take an example. The N.R.C. was originally conceived to carry out research which would help private industries but which those industries were nevertheless unwilling or (as they claimed) unable to undertake. In other words, public money was used to help private industry turn up a sizeable profit and expand. Now, I would ask: how much of this public money used for industrial research has helped the working conditions of the laborer? And it is not enough to say in response that the unions are at fault for having favored the bread and butter issues over questions such as work safety or health hazards. If they were to manage sizeable funds for scientific research, it is very probable that new kinds of demands would be made on scientists. And science, because it would be appropriated differently, would gradually change.

Note that in the previous argument, no reference has been made to values. All that has been argued is that new modes of appropriation of science should be made possible so that the scientific communities would start behaving differently.

Another example will show that only a bit of imagination is needed to multiply possibilities. In Holland, storefront organisations of scientists have been formed by universities and volunteers to act as knowledge tanks for citizens at large, citizen groups and the like. Suppose you are concerned by a particular pollution question affecting your immediate environment, or by the impending construction of a nuclear plant in your area, where do you turn to check and eventually counter the deluge of information which utilities and industries will generate to demonstrate the safety or the cleanliness of their activity? The Dutch experiment shows that expertise can be distributed more equitably so as to make possible the interplay of counteravailing forces within society and thus insure a continuation of basic democratic processes. Now, the problem with the Dutch experiment is that it rests almost essentially on the good will of concerned scientists and the uneasy support of open-minded university administrators. As Dorothy Nelkin pointed out in a recent article on this topic in the Bulletin of Atomic Scientists, this is too precarious a base and the survival of such experiments is always problematic. What is needed is the creation of a real social demand for this expertise so as to insure the existence of a supply.

It is this latter observation which leads me to focus on the means to appropriate scientific knowledge. For example, if unions, once again, receive government money to pursue scientific and technical research in whichever manner they want, they will use this money to increase their bargaining power and, consequently, they will devise strategies to appropriate scientific knowledge which correspond with their objectives. And the same argument can be repeated for any social group in a position to tap scientific knowledge. My point is that we should try and multiply the ways in which science is appropriated so that, in the end, practically all sectors of society are involved in this process. In other words, scientists should continue scurrying for grants but granting agencies or organizations should be as numerous as possible and representative of many interest groups.

V

Conclusion

I barely scratched the surface of possibilities but such is not my intent and, anyway, I could not hope to carry out such an immense task by myself. Instead, it seems to me that these hasty suggestions can be used to refocus our discussions and to draft a research domain truly worthy of support. Briefly stated, the question to be solved is the following: How can we make sure that the benefits accruing from scientific and technical activities are distributed in a more equitable way than is the case at present?

I suggest that posing the question in this fashion will insure that we do not play the favorite game of academics and of their admirers -- namely repeating for our own benefit the scientists' trick which consists in posing as experts on human values in relation to science and technology. I suggest instead that we explore the range of questions that can be raised in conjunction with the new framework proposed above.

Let us remember, incidentally, that other meetings also sponsored by the SSHRC are presently taking place or will shortly take place. They will deal with other possible areas of research and they will compete for funds with us. Our task, if I understand the message from a SSHRC representative who passed through Montréal a while ago, is to convince this public organisation that our project is truly worthwhile. This requires a clear focus so as to offer a simple, compelling message. If we keep with the discussion framework proposed in the September circular, we insure our getting lost in vain, stratospheric considerations and we insure our being completely ineffective. As for my counter-proposal, it does not insure success either, for it would be easy to deflect its potential impact. However, its thrust is such as to make life more difficult for those intent on preserving the status quo.

ISSUES IN THE INTERACTION BETWEEN ETHICAL PRINCIPLES,
POLITICAL AND ECONOMIC PHILOSOPHY AND
THE DEVELOPMENT OF PUBLIC POLICY

93

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1) The points that I shall be most concerned to make have to do with certain gaps in our moral knowledge, specifically gaps in our knowledge of the concepts with which, as they stand or as they might be revised, we might seek to control technological change. We shall have to have more than concepts to do the controlling, of course; but we can think of control as a matter of applying, in prescriptions and prohibitions, concepts; and well-considered applications begin with well-chosen, and well-understood, concepts. I shall begin almost immediately to enumerate the gaps that I have in mind. In my concluding remarks, I shall say something about the nature of philosophy that will explain why it is the business of philosophy - though not of philosophy exclusively - to expose such gaps and to do something to fill them. In those remarks, I shall also do what I can to vindicate the claim that it is important business, even when it is carried on in a style of philosophy that is less grandiose than many people hanker for.

2) I hope that though I am about to turn to another way of identifying research priorities, no one reading this paper will lose sight of the fact that one way of identifying them is to see what productive people working upon the subjects at issue choose on their own initiative to do next. No other way is likely to do as well in reflecting the full range and variety of expert activity and opinion; and no other way can supplant it in the breadth of the allowance that in principle it makes for multiple spontaneous initiatives. Furthermore, no other way gives so much weight to cumulative consensus among the experts. In particular, to look for gaps in current work, as I am about to do, runs against the range of judgements by writers and editors that, given present skills, scholarly or scientific interests, even social demands, other topics are more worth treating, even repeatedly.

On the other hand, nothing much like organized collective deliberation and judgement stands behind the proportions of effort actually allocated to different topics. The proportions are in large part the unintended collective consequences of individual actions that follow fashions not themselves entirely defensible. Much of the effort, furthermore, avoids or scants empirical inquiry in favor of repetitive exercises of technical proficiency (in symbolic systems especially invented for the purpose, to vary a wisecrack of Bradley's). Undue specialization is one cause of this misapplication of energy; and specialization also leads to the neglect of topics that fall between specialties. The proportion of effort that some of these topics get is no effort at all; and all of them must fight their way against the attachment of learned authorities, among them editors and

referees, to the current system of specialization.

So, while the search for gaps will not give us by itself a better standard for identifying priorities than accepting the initiative of researchers, and certainly will not justify us in setting aside the directions taken by that initiative, it may give us a different standard, which can to some degree correct and make up for the imperfections of the first one.

In any case, since the gaps that I shall remark are gaps that I propose myself to do something to fill I shall not (on a prospective view) be abandoning the first standard while I operate (on a present and retrospective view) with the second one.

3) To begin my survey of gaps, I point to the critique of preferences. So little has been done to show skeptics outside philosophy how results in ethical theory and aesthetics establish the possibility of a critique of preferences, which would rectify them by appeals to knowledge, that economists and other social scientists still think of preferences as utterly beyond argument. Unqualified, that opinion can hardly survive serious inspection of a few examples with moral implications. We know - assuming that we have any experience at all of engaging in moral discourse and inquiry - that preferences which favor torturing other human beings, or license deceiving them, or sanction denying them a livelihood, are morally wrong. However, even if some concessions in the direction of a critique of preferences are allowed in respect to obvious moral outrages, enough of the skepticism remains to block the spread of civilization. The party of civilization is reduced to one sub-culture among others, on the footing with motorcycle gangs.

Besides establishing the possibility of a critique of preferences, one ought to show how the critique is actually carried out in many instances, and something like rectification achieved. Doing so, of course, might be invidious; and it certainly raises the spectre of paternalism. Sometimes the knowledge that the critique will invoke will have to be inarticulate - non-propositional - knowledge: for example, the knowledge of the comparative merits of different string quartets, which people get by playing quartets together; the critique will have to be on its guard against failing to give due credit to inarticulate knowledge gained in less genteel activities. May not the motorcycle gangs have aesthetic standards, and moral standards, of their own? Indeed they may, and a well-conceived critique of preferences will discriminate what can be saved in them compatibly with opening up the lives of the gang-members and the lives of people whom they affect, to even better things. These matters, however, are part of the problem; they do not furnish edicts against thinking the problem through.

4) One of the bodies of knowledge to be appealed to in the critique of preferences is knowledge about needs and about the provisions suited to meeting them. Needs themselves, however, require a critique. It is possible, I think, though not entirely easy, to state a list of basic needs, physical and social, that almost everyone will agree are to be ascribed to human beings with presumptive universality (that is to say,

universally, as at least a rebuttable presumption) and are to be given a certain priority in choosing policies. Such a list, generalized over all technologies, would include the need for a life-supporting environment, the need to keep the body intact, the need for food and water - defining these three needs so that they are wholly distinct; it would include, besides, needs for exercise, for companionship, for sexual activity, for social status and recognition, for education, for recreation. Such needs, taken together, make much more substantial claims on resources than is commonly allowed (e.g. again, by economists): The need to preserve the body intact has, for example, very expensive implications for industrial safety.

The crucial problem with needs arises, however, from the extension of the concept to cover needs derived from current social arrangements (roughly, social conventions taken together with their physical embodiments). Carried too far, the concept unduly inhibits the freedom to follow preferences, both in personal choices and in social ones. Needs take precedence over preferences; so too much scope for needs leaves too little scope for preferences. The economy currently encourages undue scope for needs by encouraging consumers to believe - and act - as if they could not do without the latest appliances and modes of social life made possible by technology. Thus the concept of needs is continually abused, becoming one of the leading devices for getting people to accept technological change passively.

Yet the concept can be used with some legitimacy beyond the narrow sphere of the basic list, since, to cite just one consideration, basic social arrangements cannot be quickly changed. It also effects certain welcome simplifications in the social choice process. Whatever is decided on a basis of meeting needs - if needs are given precedence, and there are resources enough to meet all of them for everybody - will be so much gained in social choice before the complications of aggregating conflicting preferences have to be dealt with*, and these complications will arise only for less important issues.

All these matters require a good deal of inquiry by a number of people. In ethical theory, they open up the possibility of defining utilitarianism in a more convincing way than ever before. So defined, it would operate with a flexible boundary between needs and preferences, requiring attention to both, but extending the scope of needs when there was something like universal assent to extending it, restricting it when there was not. The restriction would regain a firm footing for needs, while it left more matters to be dealt with by preferences, an advantage (given the restricted agreement on needs) for personal freedom, though a problem for concerted action. Allowing thus both for variation in the relevant concepts, as well as in their prescriptive application, utilitarianism so defined would be closer to the actual practice of politics than the classical forms.

* Cf. such leading works on social choice theory as Kenneth J. Arrow, Social Choice and Individual Values, 2nd ed. (New York: Wiley, 1963) and Amartya K. Sen, Collective Choice and Social Welfare (San Francisco: Holden-Day, 1970).

5) The subject of needs inevitably carries one on to the subject of justice. One basic principle of justice is to distribute goods so that everyone's needs are met. Is literally everyone to be included, however? Distributive justice is one subject on which philosophers, following the lead of Rawls and Nozick*, the first a good deal more useful in leading than the second, have put forth much effort during the last ten years or so; but this question, which affects the extent to which we are obliged to meet the needs of people in less affluent countries, remains both neglected and controversial.

Another great gap in our understanding of justice has to do with the extent to which prevailing popular ideas about justice correspond to the principles discussed by philosophers. Whether or not there is a grand "crisis of legitimation" affecting the state and civil society in Canada, there is a lot of confusion about what the income structure ought to be (apart from what, by the operation of various advantages in the market and in collective bargaining, it continually becomes). Some consensus on distributive justice would reduce the confusion; but until we know what the current state of opinion is, including what consensus may already exist, we shall not know where to begin, or where in discussion to move next.

6) Another subject much discussed recently by philosophers, with considerable success in advancing our understanding of it, is the subject of rights.** We still, however, have much to learn about how assertions of rights are justified, especially when we are dealing with rights not yet recognized in law. It can hardly be allowed that rights can be multiplied as far and as fast as people invent formulas for them; but no one has yet shown how we are to check the multiplication. We may require a principle of individuation for rights to do so, and such a principle may be a good deal more difficult to identify than the moral principles to be invoked in justifying rights.

7) If these gaps exist in respect to the critique of preferences, the critique of needs, distributive justice, and rights, we must, and do, lack a doctrine that puts these topics together in a satisfactory coherent doctrine. If technological change and with it social change continue at anything like the pace of the last couple of centuries, we are perhaps inevitably going to go on lacking such a doctrine, since we may continually have to be amending - revising and supplementing - any approximation to a coherent doctrine that we have in hand. We could, however, have a more coherent current approximation than we do. It is fair to say that Rawls does offer, somewhere or other in his theory of justice, a place for all these topics,

* John Rawls, A Theory of Justice (Cambridge, Mass.: Harvard University Press, 1971); Robert Nozick, Anarchy, State and Utopia (New York: Basic Books, 1974).

**For a comprehensive survey of the present state of our understanding of rights, with important original contributions, see Theodore Benditt, Law as Rule and Principle (Stanford: Stanford University Press, 1978).

and hence the beginnings at least of a filled-out doctrine, sometimes a good deal more. To date, however, the discussion of Rawls, though immense in bulk, has tended to neglect his claims to having outlined a comprehensive guide to policies social and personal, in favor of attacking his argument to the choice of his basic principles in "the original position".

8) Certainly we lack a coherent doctrine consolidating these topics in a way that marches along with citizens' and politicians' views and thus furnishes effective guidance to sharing the benefits and burdens of economic activity, technological change (including responses to more expensive energy and to ecological dangers). Such a doctrine, if we had it, would, one might hope, also effectively answer to incentives, current or future, and thus be realizable without an undue amount of conflict or alienation. If people were less boundlessly acquisitive, which is what they are encouraged to be by the present processes of bringing in technological change, many of the problems raised by technology would be easier to manage. A consolidated doctrine might persuade people to be less acquisitive, by helping to make civic and other-regarding incentives more intelligible and at the same time more attractive. However, we have yet to organize what we know, or might know, about incentives in this connection. Rawls's theory is a case in point: If certain incentives are required for people to put forth their best efforts, his difference principle will lead to highly unequal incomes and possibly to a highly class-stratified society; on other assumptions about incentives, almost equally plausible given the state of our knowledge and the apparent plasticity of human nature under socialization, it would lead to a egalitarian distribution of income and an egalitarian society. A theory of justice so indeterminate on this issue requires some further thought before it can be used either to criticize or to support the status quo.

9) I mention finally the subject of compromises. The sort of coherent doctrine consolidating the topics of preferences, needs, rights, justice - and incentives - that we can hope for will (I suppose) leave a good deal of room for choices which the doctrine itself will not settle (peremptorily, or by some sort of approximation to lexicographical priority). People will have different preferences - different preference-profiles - about these matters; and if these profiles are to be aggregated without having the process break down because of difficulties raised in social choice theory, there will have to be room to invent new policies that compromise among these preferences. However, we know little about the logical features of compromises as it might be studied by the logic of questions.* The theory of bargaining, in spite of a number of subtle refinements, depends too much on homogeneous measures of the value of various policies in utility**, whereas what is needed is attention to the possibility of changes in the feature-by-feature composition of the policies. (For example, if people disputing

* Cf. Nuel D. Belnap, Jr., and Thomas B. Steel, Jr., The Logic of Questions (New Haven: Yale University Press, 1976).

** Cf. the variants of the theory of bargaining represented in Oran D. Young, ed., Bargaining (Urbana: University of Illinois Press, 1975).

an issue are deadlocked regarding the attractions of three policies with features F_1 & F_2 , F_3 & F_4 , and F_5 & F_6 , what are the various possibilities of formulating a compromise policy, and how does one identify which formulations will break the deadlock?)

10) The gaps that I have mentioned, and the activities that would help fill them, accord with my conception of philosophy as a sort of social science concerned with language. It is in the uses of words - where else? - that philosophy observes what concepts we have and how they are related. Were philosophy to do no more than give systematic accounts, based on careful observation of linguistic practices, of our received conceptual apparatus, it would be doing something immensely important - how could it not be important to know just what various leading features of our conceptual apparatus amount to? Furthermore, in the very course of seeking such accounts, philosophy exposes innumerable confusions, common and uncommon, some of which can be remedied by using the received conceptual apparatus carefully and consistently. Other confusions may be removable only by revising the apparatus where it is as it stands indeterminate or inconsistent. Philosophy generates suggestions - plural, competing suggestions - about revision and debates their merits. These suggestions and debates still lie within the province of philosophy considered as a social science, though here it is in part an applied science, with a normative orientation. The same thing can be maintained about the deepest questions that philosophy takes up - questions about the possible forms of languages and hence of conceptual apparatuses and about the implications of such possibilities - and limits for the self-interpretation of human beings in nature and in history.

If we are ready to agree that it is no drawback to knowledge that inquiries seeking it must always take place in a context of assumed human purposes, and to accept it that an assumed purpose to deal with other human beings justly and humanely suffices to define a context for moral inquiry, then we may take heart in the fact that we already have a good deal of moral knowledge and are in a position to find more. We know a good deal, for example, about what the directest and most obvious requirements of justice and humanity are; and we know that they so far overlap that persistent inquiries under one head will cover all, or almost all, the ground to be inquired into under the other. Logically, humanity requires meeting people's needs; so does justice. Empirically, meeting their needs requires keeping them out of fires and keeping them provided with vitamins. Does it undermine the knowledge that we have in these connections - knowledge, founded on observed linguistic usage, of the relations of concepts; knowledge, founded on other observations, of cause and effect - that in a sense we - inevitably - beg a question about its relevance to us by assuming at least a generalized, unclarified purpose on our part to deal justly and humanely? One might as well reject the relevance of trying to discriminate between well-founded and ill-founded scientific predictions on the ground that it begged the question to assume being interested in accurate predictions rather than finding divination more mysterious and thus more fun.

Many people think that it makes the assumption of moral purpose less arbitrary to suppose that God wants us to have such a purpose; and other people, nostalgic for religious belief, would like philosophy to point to

some substitute for God's will that is equally compelling. The assumption about dealing justly and humanely is not arbitrary, however; it can be shown (and here we touch on the deepest questions of philosophy) to be specially suited to obtain universal agreement on the part of everybody who is to be affected by inquiries and actions in the context that it defines. Even if the assumption were perfectly arbitrary, however, - something adopted because we were just pleased to think that way - the truth of the matters alluded to would stand and so (by our fiat) would the relevance.

The truth of those matters stands regardless, too, of the fact that it is inevitably somewhat arbitrary to draw a line between the two sorts of knowledge obtained in moral inquiry - conceptual and empirical. Knowledge of cause and effect is reflected in the character of the concepts that we have. For that reason alone, it is a mistake to think of philosophy as dealing with concepts alone, though concepts are its preoccupation. We should expect it to intersect and interact with other disciplines, especially when, as with the impact of changing technology, questions of revising and extending our conceptual apparatus come to the fore. I have brought up a number of topics that are, I think, of fundamental importance to making effective use of our conceptual apparatus to control technological change. They invite cooperation between philosophers and people from other disciplines - especially cooperation with social psychologists, on the subjects of popular ideas about justice, the application of the critique of preferences, the effectiveness of various incentives and of socialization respecting them, and the application of ideas about compromise. I have also, however, had economists much in mind: New currents of thought in economics - the post-Keynesian school; the humanistic school - have brought back into prominence the discontinuities that bar the operation in the real world of the processes so smoothly modelled by neoclassical economists.* Some economists are beginning to talk about going back to Menger [1840-1921], abandoning utility orderings for the whole choice field in favor of hierarchies of wants.** The concept of needs has already begun to come back with this change; and the discontinuities that would be attended to in the study of compromises as I envisage it may obtain such attention in the same quarters.

* Cf. Alfred S. Eichner, ed., A Guide to Post-Keynesian Economics (White Plains, N. Y.: Sharpe, 1979).

** Cf. Mark A. Lutz and Kenneth Lux, The Challenge of Humanistic Economics (Menlo Park, Calif.: Benjamin/Cummings, 1979).

WHAT SHALL WE ATTEMPT?

Gail Iverson Stewart

Prefatory Note

I find myself in the somewhat awkward position of being, not unable, but unwilling, to rewrite my paper in accordance with the editors' suggestions or in such a way that it could be fitted into the report on the project, or at least the preliminary report which I have seen. I believe that the suggested changes would simply have had the effect of bringing my paper into line with the emerging approach to the domain which I attempted to illuminate and which I decry - (a stance in which I felt I was supported by several commentators).

I have therefore (apart from modest corrections, re-spacings and clarifications) simply juxtaposed to my paper in this editing one particular comment on it. In so doing I hope to further illuminate what I believe to be a fundamental problem with the setting of research priorities in the domain and the domain itself, if not also the policies of the SSHRC and the SSHRC itself.

If you are reading this I do not think we should fail to appreciate the courtesy of the editors. I especially shall owe them thanks for their courteous treatment of an overdue manuscript. Already overdue when I turned to it at the beginning of this week, I have found the decision about what to do about its revision a difficult one. I don't know about you, but I tend to put off as long as possible coming to conclusions and facing up to situations that involve me in moral dilemmas and awkward - if sometimes creative - actions. I hope my stance in this matter will be understood as not simple intransigence or criticism of the project, but a desire to press its creative potential well beyond well beyond its present formulation, and to resist it if this does not develop. (April 11/80)

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I, and more, point to the disease in such business as brings us together. It is part of the illness which besets our culture.

We seek to locate and release the healthy tissue in the dying form.

What we do together unless radically different from a host of other similar events will be illness itself.

There is hope that this paper and comparable contributions might be grasped as the starting point for our discussions.

Contemporary public process is susceptible to interruption by "a values discussion looking for a place to happen." (Franklin) We by contrast are invited to such discussion, privileged by our terms of reference and further

assisted by the matter in which the process has been organized. Granted, the invitation is ambiguous, but under the mantle of science and thus, in our land and times, legitimacy, we have an opportunity to accomplish a distinction, to give birth to fresh form, to validate a new dimension to scientific thought, to transcend our own beginnings.

By identifying and releasing "Human Values" from where it has become entangled in "...and human values", locating science as we have known it securely in the context of the former, even while leaving human values in the context also of not being insusceptible of some further illumination through such science, we may accomplish the paradox, identifying, from within science the limits to science, and (necessary to complete the trick) do this without also rejecting the possibilities of science beyond its present limits.

To accomplish this we shall need to concern ourselves as both subject and object of science, both researcher and researched, present in the event as human being and scientist and object of science, in a right ranking of these capacities. So much weighs against such possibility, including the impulse and form of the exercise itself that hope seems more appropriate than optimism. But much is expected of us. And I anticipate that we shall expect much of ourselves.

I am fearful, as others may be, of being found wanting, inadequate to the event. I would welcome your support, as I shall welcome your response to the hope, mine and, I sense, a multitude's, so apparent in this paper.

This paper has been prepared by one but is indebted to many for its evolution and content. Richmond Olson, one of the wise ones, stands first among these. The paper includes its own preliminary forms, available from the author on particular request.

I wish to thank Ian Stewart for special help and support.

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I and many persons are troubled by the human situation as we know it today. My evidence comes from my own feelings, the appearance and testimony of others, despoiled nature. I see many indications that all is not well, and sense it in inchoate forms.

A few institutions grope for appropriate response without conspicuous success. Events seem poised at a turn, and we wait for a sign - - some leadership, perhaps permission? Millennialism, some say. I say, more. To an extra-planetary observer much present human action must seem radically perverse, deeply puzzling, lacking simple wisdom. I, on earth, say "frightening".

I and many, inheritors of an intellectual tradition that shaped Western civilization, and also of that optimism that is rooted in rationalism and science (fertilized in our consciousness by the Great Peace of the 19th century), a faith which is played out before us daily in our public forms and forums, find ourselves trying to understand our own being and situation in discrete, reason-able terms. We look for evidence, for the compelling argument, the thoroughly documented study, the reasons for decision, for "balanced" judgments. Living day by day in this milieu, not war, depression, Holocaust, or (more recently) the realization that the mass of unintended indirect consequences of our formally organized activity is overwhelming its intended consequence, and threatening our very existence, seem to have destroyed our faith in reason, the power of knowledge. (Witness, this gathering, its auspices and purpose, its audacity to address human values in scientific context.) So we seek, still, "explanation", turning "disciplined" eyes upon our problems, studying poverty, unemployment, pollution, crime, disease, technology, communications, human values, subjecting them to ever-narrower scrutiny through the ever-finer meshes of our minds. We subjugate our selves to "the power of knowledge".

The victim in all this, of course, is the context, the "big picture", the integrated stance, wisdom. The "authority of wisdom" is denied. In our persons the loss associated with fealty to "the power of knowledge" is the life well-lived, the "right relationship" with children, friends, nature, vocation. In our studies it is the humanities that fall victim.* In our public affairs it is humanity. On the planet, the victim of such persistent oversight, such sustained inattention as comes from a too sustained narrowly focussed concentration, too "scientific" a perspective, could well be humankind. And all for the want, not of a horseshoe nail, but a properly footnoted article in

* "...I pass by the splintering of the Canada Council in silence - - except to object to the subordination of the Humanities to the Social Sciences, and to the use of the word "research" as an inadequate term for the humanist's reflective activity." (From "The Humanities in the World at Large" by Professor George Whalley, Head, English Department, Queen's University, Keynote Address at Carleton University's Conference on the Humanities in Society, November 20, 1978.) And what of the subordination of human values to science and technology? Are human values to be relegated (as have social and environmental and ethical matters) to the lowly status of subjects of "impact studies" in the management sciences?

Science - - a "finding" that would legitimate our looking at our situation whole, give us the permission of science to heed the fullness of our situation, allow the power of knowledge to yield to the authority of wisdom.

Increasingly, though, matters that have been at the periphery of the reasoned and reasoning vision are being forced on our attention. Whether it is the formerly attentive wife claiming superordinate validity for her voluntary activity in the community, a roadblock set up by native persons, a middle-aged friend suddenly dropping out, a young person's suicide, or whether it is the insistent evidence that though we are wealthier we are not better off, we are challenged in our claims for the continuing legitimacy, in human terms, of what we have been doing as scientists, experts, professionals. Increasingly, as the democratic logic of extending the franchise gives (through serendipity?) effective voice to women, Indians, children, unabashedly personal voices speaking for themselves, and for their husbands and fathers and brothers and sons - - (and for animals and trees) we are alerted to the fact that all is not well in the Western world. (A friend spoke recently of attending an international conference on children, and listening as representatives of country after country addressed the developed world, saying in effect: "We have always known that man is related to man, and to nature. You seem to have forgotten.")

And the issue then seems to pose itself: How shall we, (reason-able men), respond to these human voices from all over the world, including this land, and right in our own homes, and perhaps even our own voices in other forums - - these voices which decry, and deny the validity, of the very assumptions which have brought us together in this exercise for the SSHRC, with its assumptions about the relations between governments and experts and citizens, its objective ("dis-passioned") approach to science and technology and human values, its narrow experiential base in the varied life of the country, its assumptions about communicating with each other through the written and the spoken word?

Shall we ignore these voices, casting the issues they raise as posing a struggle between reason and compassion, between the objective declaring of the public spokesman and the subjective voicing of the private person, between mind and heart - - or shall we seek the grounds for a broader rationality, for an adequately framed reconceptualization of the capacities of mind, a fresh grasp of the roots of our divided disciplines and institutions - - for reason more deeply grounded in human values, and hence, a reason for faith in reason, thus accomplishing the paradox? Shall we join the living flow or elect to stay beached, sifting again through the dry sands of an unrooted objectivity?

Shall we try to confront and work our way through the problem, creating the distinctions that allow both life and a living science?

This, or so it seems to me and many, is the juncture at which we stand. We who are committed to the primary role of thought and committed to that caring for our persons, our family and friends, our fellow countrymen, life itself (a caring that finds its expression in decent process, in the gentleness of common courtesy and the generation of sufficient surplus to allow the release of energies for creative thought) must now be prepared to think about thought itself more carefully. The onus of proof of the worth, the human value, of our particular way of thinking, and of applying that thought to the world by way of prescription (most often, public policy advising or personal counselling, both "therapy" - or teaching in preparation for these) now rests with us, its broad base of support in the community eroded. What have we to say for ourselves? Can we defend the exercise in which we are engaged in its own terms, for example, or our disciplines, or the universities and the directions they have taken, or the SSHRC, or contracts to social scientists to give policy advice to departments of government, or even the continuing validity of governments in the form of sovereign nation states (and such associated matters, for example, as the privileges given by these states to self-interested corporate entities?) Can we defend research grants to social scientists in the problem domain of science, technology and human values? Can we do this without re-searching our own human values?

Would we, convened together as persons, members of the community, citizens, be inclined to let a small group of experts, such as ourselves, most with substantial vested interests in the matter, set research priorities with respect to science, technology and human values for research that is to be supported with our resources? Are not our vested interests as human beings, who wish to survive and thrive, and have life on this planet survive and thrive, much broader and deeper than those represented in the shallow proxies for human values implicit in the images of man and mankind that infuse our sciences and sustain our "expertness"? And is there even justification, and if so when, for the latter being used, applied in techniques for the governance of persons who themselves are responsible for the governance of their governments?

(I have a valiant and improbable dream that some group of expert policy advisors, such as ourselves, meeting somewhere in Canada, sometime soon, sensitive to the difficulties of such questions but also their validity, will see that it is impossible to continue in the form in which they have been convened. Reconvening themselves as responsible members of the

community, they will make clear to the community the limitations of the policy sciences and science generally, restoring these studies from their current renegade posture in occupation of the centre to a position of much more modest pretension, and even a closely monitored pretension. Such voluntary containment of implicit claim was embraced at an earlier time within the notion of professional ethics, so in my dream the group reconvenes again in their expert condition to consider the implications of professional ethics for such activities as advising governments, doing research, assessing research priorities, Such skill in re-convening, in the conscious use of form, (tool, medium), in my dream makes the difference between years of turbulent revolution, not unlike those in which the "power of reason" assumed the throne, and an evolutionary turn, frightening, yes, but also exhilarating, not violent.)

Whatever may emerge from our group, there is now underway in the Western world an intensive search to discover (or identify) the appropriate limits to scientific activity and applied science that is illuminating the nature of science itself. In discipline after discipline, new "discoveries" (or recovered inventions?) - "moral" philosophy, "political" economy, "humanistic" psychology, bio-medical "ethics", science appreciated as "art", inventions as "resonant image" and hence contingent - are allowing narrowly framed specialists to allow themselves to reintegrate their special studies with the broader course of human endeavour, allowing social scientists to feel relieved of obligation to provide policy advice to governments, allowing all to move towards a broader rationality, a broader reason, perhaps even towards grace, as full-franchised members themselves of the world they have been objectively studying, responsible now with all and everyone for its condition. ("For the attainment of grace, the reasons of the heart must be integrated with the reasons of the reason." Bateson)

So pervasive has this search and discovering become that the existence of a "Social Moment", occurring at some confluence in Western civilization in the recent past (perhaps even located and locatable in Canada) at which there was an overall shift in legitimacy towards such loci as "integrated studies" (e.g. science pursued in the context of the humane studies) has been hypothesized (the Iverson/Olson Social Moment*). The exact dating and location of this moment are still to be established by detailed historical

* "The Bankruptcy of Contemporary Moral Philosophy - Ethics Without Foundation", Waverley Papers No. 3, 1979

research, but it will undoubtedly be marked in later generations as an historic turn, a shift in human context, more meaningful than to many living contemporaneously, as is not unusual with respect to the geneses of historical changes in human perspective. We live, it is suggested, in post-revolutionary times, not for the moment but after the moment. (Should this hypothesis be correct, our task in this exercise would be correspondingly lightened - - no need to accomplish the shift, the change in context, but merely to ensure that it found appropriate reflection in institutional policy....)

In retrospect, it is now possible to suggest that in naming, reifying, institutionalizing, and then elaborating upon the institutionalization of our mental concepts (inventions), we then, forgetting (perhaps through the habit formation that accompanies familiar use) began deifying these forms of our own making, forgetting their origin and seeing only their importance, and became caught up in their perfecting, forgetful or fearful perhaps of the need ourselves to move beyond them, to invent new forms to sustain and nurture our own and our children's growth - - successor forms, for example, to the university, the nation state, social science research councils..

Individuals among us are still so caught, I suspect. Additionally, many continue to draw their sustenance from these dying but unreplaced forms, relying upon community charity for continued support of their institutional base. ("We are paying teachers to teach and students to listen to them.") in a continuation after its time of the reification-deification process with respect simply to the "word" (including such socio-theological concepts as equity, justice, peace, human rights, and, more recently, "human values"), many in the culture meanwhile having developed and using more embracing literacies, reading environments (including writing in its many dimensions) and communicating with film, music and touch (in warm baths).

(I am trying, you understand, to develop an adequate myth, an adequate hypothesis, (an adequate hypothemyth?) to allow Canadian universities to close their doors for a few months while they reorganize around a fresh set of focal points for learning....)

Indeed, in the present event we are caught up in a dialogue among persons from increasingly narrow and specialized bases of legitimacy (by certification tests and guild processes or more subtle tests disenfranchised outside our own domain) and yet all of us somehow hoping that the net result of our efforts will be at least benign if not actually beneficial to more than ourselves.

Various friends: a medley of voices:

"We have all become disabled, our rationality having become the vehicle of our own and the people's exploitation. The narrowness - of disciplines, of institutional purpose - and the legitimation of that narrowness in the interests of specialization and exchange, has permitted that narrowness to exploit us, to turn on its proprietors. Thus the wealthy man who begins his accumulation process out of a desire to enable the fulfilling of his humanity becomes instead consumed by the wealth accumulation process, and in the end comes not only to deny his own humanity but the humanity of others in the process of wealth accumulation.

Our mode of rationality, the driving force towards a narrowing of disciplines, has, carried beyond its useful limits, served also to legitimize a narrow self-interest on the part of constituent groups in the community (themselves indebted to this narrow vision for their logic) and has opened the way for an exploitation of institutions by those who would exploit the narrowness for their own advantage.

This brand of reason (the divided consciousness that, focussing, constrains its field of vision, and then, forgetting that this was merely an instrumental technique, continues to move merely within that field, without depth) in service of humanity and perfection of thought, has, through loss of context and rootedness in human values, become visible as a particular form of thought, a primitive form of consciousness, of thinking about thinking. Thus my fear that, inspecting science and technology for its consequence on human values, though displaying as awareness of human values as something worthy of consideration, comes at the matter wrong end to, human values in the context of science and technology rather than science and technology in the context of human values. There is no rational point in pursuing the former question, although it is certainly an interesting question, until the validity of the latter is agreed, or the whole matter will disappear into a black hole, language, chief tool of rationality, having turned upon itself for lack of the necessary differentiation of levels of meaning, the need now being to distinguish levels and contexts, to give additional dimensionality to our thought. (And, indeed, some scientific pioneering of this sort is already occurring.) And so we have come to the end of a long phase in an important civilization in the world, and perhaps none too

soon, as its habits of mind have almost strangled and made meaningless our articulation, as well as suffocating our imaginations, while its waste products, including waste persons, accumulate everywhere. Insofar as communications is concerned, it is clear that pursuing the technological imperative with a weather eye for human well-being is almost certainly to put the cart before the horse.

So great is the reformation that seems necessary, and so potentially disruptive (but also rediscovering) will be the process of reinstalation and reintegration of human purpose, that rather than the neo-conservatism of our times which has its philosophical origins in the repair of society's ills by the supposed reinvigoration of narrow self interest, rather than than, the society should be employing its wealth to broaden the safety net for all because all will be affected."

And, harsher voice:

"The scholarly community in Canada, its message of a divisible rationality writ large in its medium of walled fiefdoms, is in danger of losing its credibility in the larger community, upon which it has become dangerously dependent. Nor does the near-bankruptcy of its narrow disciplines, most notably and by self-confession in the social sciences and humanities-gone-scientific, seem to keep even some of its most senior members from attempting to seek a privileged position that will enable them to whisper in the King's ear their special advice. That individuals of the academic community may pursue a broader and more faithful purpose and may wish the larger community received this message is not in dispute, but speaks to the difficulty of transmitting certain kinds of messages through media that themselves transmit other messages, or, communications. We are all involved in similar difficulties, of course, and attempting to discover how we can communicate about the things that matter."

Others:

"Maybe this SSHRC exercise will have produced "The Midwife Papers" that will release new life and vitality in the scholarly community, even perhaps redefining its location and extent...."

"Everything in this paper is about human issues in communications policy, and about science and technology and human values and everything else as well, isn't it?"

"I think so."

"Suppose the Native People living in Canada are rooted in a culture in which they feel themselves to be connected among themselves and with us without talk or visible forms of organization. Suppose Woman, Child, feel the same. (Individuals, of course, may have learned otherwise.) Holding this supposition and being concerned too with Man for whom the use of abstract thought as tool rather than environment has been sustained (many individuals having, however, been trained away from such contextual appreciation) let us then talk of communications technology, communications policy in Canada..."

"Individuals among the Native People are excited by the notion of a gathering of wise persons, perhaps involving the Governor General, in a new understanding of the potential of this office. How might we identify such persons among us? How would wise persons feel about "science, technology and human values" in the context of the humanities and the social sciences? What, for that matter, would they think of the humanities and the social sciences? What is a social science and what is it for?"

"It might be one thing to risk using Telidon ourselves, but is it moral to try to sell it elsewhere?"

"How do you help a people meet a silicon storm?"

"What is the communications policy of this project? What mode of communication is the official mode, the official "language" of the SSHRC? of this project?"

"Analog/Digital. These two forms of communication are basic to all natural systems of communication. Analog communication involves continuous quantities with no significant gaps. There is no "not", nor any question of either/or; everything is more or less (e.g. all non-conventionalized gestures, rhythms, and the context of communication

itself). Digital communication involves discrete, discontinuous elements and gaps. It allows for saying "not" and "either/or" rather than "both/and" (e.g. all denotative, linguistic communication). In nature the digital is the instrument of the analog (it is of a lower logical type and a higher order of organization.) In our culture the instrumental relationship is often reversed.

The two forms of communication are not in opposition, and the general function of the digital is to draw boundaries within the analog like the on/off switch of a thermostat or the phonemes arbitrarily carved from a sound continuum."(Nichols)
(underlining added)

...

Analog/Digital. These two forms of working.....

"From rise of dawn to set of sun
A woman's work is never done."
(Folk saying)

"She doesn't work, she's just a housewife."
(Consultant's report)

...

Human values/Science and Technology. These two forms of
.....
.....In nature the digital is the instrument of the analog
In our culture the instrumental relationship is often reversed.
.....

Postscript

A commentator writes:

By: Brian Robinson
 Department of Geography
 Saint Mary's University
 November, 1979

It is a question of opening up a discourse. Of beginning where things are already in parentheses and broken up... as in "(reason-able men)" and again "(dis-passioned)" [p.3]. Such fragmentations are raids on assumptions. But they are enclosed by the essay form with its bland amalgam of subjective and objective.

Descartes, when he fell through his cultural assumptions, found "faith" [p.3]... even a comfortable metaphor... the meditation, the discourse. Also, and it is astonishing yet it is undeniably a conversion. It's not so much reason, it's his faith that is so formidable and admirable... genuine desire.

For us there is much less. In a poorer season our method is a raid on the inarticulate. Perhaps less than a raid... what Roland Barthes has termed (and he doesn't mind the ambiguity) an excursion^{*}, which produces not the polished essay but fragments of a discourse on...? well perhaps it may be little more than aphorism at first (where Gail Stewart ends) or a gesture (where Gail Stewart, pointing, begins)... certainly digression is one of the rules of the game. Values will not happen and they may not ever oil the wheels ("for discussion purposes"). Yet it is a question of metaphors... bringing back mountain, tree, and flower... as found objects in the fuller knowledge that they begin without value. Start from there... wool-gathering, comings and goings... spatial metaphors... "the space of a lapsus"?^{**}

* R. Barthes Lecon, Seuil, 1978, p. 42.

** J. Lacan, The Four Fundamental Concepts of Psycho-Analysis, Penguin, 1979, p. vii.

Yes, it is a question of opening up a discourse.

John R. MacCormack, Director, Institute of Human Values,
Saint Mary's University, Halifax, Nova Scotia.

The new title for the field: "The Human Context for Science and Technology", presumably reflects the felt need, expressed in many of the papers, e.g.: Bindon, Braybrooke, Hoffmaster, Jackson, Keyserlingk, Knelman, Sutherland, Stewart and Tester, for some kind of general and intelligible approach to human values. The unspoken question was, perhaps: "How do we apply subjective values to objective problems?"

The current crisis is, to say the least, double-edged. Technological advances have indeed given rise to urgent ethical problems, but the more ominous side of the equation is that the sources of human self understanding, upon which persuasive and therefore effective value judgements must be based, have been almost completely dammed up. The divorce of knowledge from moral values has rendered the latter "subjective" and correspondingly weak and ineffectual. If freedom is a function of the tension between power and the informed conscience, we are living on borrowed time.

Many factors are involved in the rise (or decline) of a civilization but among the most central are the mode and character of human self-understanding and self-valuation. Until about three hundred years ago, in both East and West, man viewed himself in what might be called the "world-historical" context. He emphasized the primary role of reason, but not at the price of divorcing it from the imagination. Thus history, literature, art and music were all taken seriously as modes of human perception and communication. The human being was seen as the sentient particle through whom the universe was made intelligible, and as enjoying a kind of partnership with the divine power which had created it. Yet impressive as man's intellect might be, the deepest respect, even reverence, was reserved for the human person as the source or medium of all values. It was not reason itself, but the love of truth and justice that reason served, that was held to be the "divine spark". Moreover the fact that all human beings shared in this potentiality was regarded as far outweighing any accidental differences. In this way the value of the human became the ground for human equality. Human nature, thus perceived, provided a basis for the development of concepts of justice that transcended expediency. It followed that positive law commanded the allegiance of the conscience insofar as it embodied that justice.

The philosophy of law provides a kind of touchstone for the evaluation of theories of man and society. The thought of Cicero, as developed in the Judeo-Christian tradition, played a key role in the development of western legal and parliamentary institutions. It is, however, sharply at variance with much contemporary legal philosophy. Cicero regarded law as arising from the societally developed conscience and as having the ultimate purpose of the further education of that conscience. But because morality sprang from the very being of the human rather than from society as such, a necessary and continuing tension persisted between the conscience and the contemporaneous society. He also distinguished clearly between such a society and the universal society of the human, which had neither spatial nor temporal bounds. This, for Cicero, was the true human context in which a person's self image properly

developed and against which all aspects of the contemporaneous society must be judged and, if necessary, found wanting.

Despite the fact that Cicero was a lawyer and insisted that the rule of law was the institutional foundation of freedom, he absolutely rejected the idea that law derived its validity from a procedural base rather than from the character of its content. He rejected such an amoral view of law as subversive of the very freedom that the law existed to promote. A law, he held, might so far depart from justice as to cease to be binding, in which case it should be disobeyed and in extreme cases, resisted.

Is this a recipe for anarchy? Like a good Stoic, Cicero held that it was better to risk anarchy than to buy peace and order at the price of tyranny. But he would have argued that such a risk is greatly reduced if the people have a proper understanding of the relationship between truth, personhood and freedom. If the universal experience of the human is generally agreed to be the frame of reference in which moral values develop-and are criticized-it is possible to achieve the degree of consensus necessary to the maintenance and development of civil society. But for Cicero, the free society was a dynamic one with authority always in a more or less uneasy relationship with the consciences of the citizens.

The modern mind finds such an approach difficult to grapple with because the conscience has now become almost completely "privatized." Consensus on moral questions is difficult to achieve because (1) we have lost faith in the human capacity to be motivated by anything more exalted than the carrot or the stick; (2) Following Descartes, we have excessively narrowed the definition of knowledge and by so doing have created the notorious "fact-value gap" and (3) human nature has either been subsumed into the physical universe, made a function of varying "process" theories of history or regarded as totally malleable by the "culture". In such a relativistic situation an asserted right of civil disobedience can easily be regarded as truly anarchic in its implications and an absolutist concept of state authority correspondingly persuasive. It is this presumably that prompts B.F. Skinner to argue that the "survival of the culture" could be taken as an absolute to which every knee must be programmed to bend.

The prevailing view of man is that of a creature who does not really deserve to be free. The image of the human which come to us from Marsilius of Padua, through Machiavelli and Hobbes, and is daily disseminated through the mass media, is widely accepted. Many academics find the Marxist view of the genesis of freedom persuasive: that far from having deep human roots, it is a mere function of bourgeois capitalism and, as such, destined to go the way of all flesh. Professor Skinner argues that if we are to deal effectively with the problems of a technological society, we must be prepared to go "beyond freedom and dignity". Yet it can be asserted, with some confidence, that if we seek to make technology serve human development, but do so against the background of such a reductionist view of the human, our project will be, in the long run self-defeating. The real challenge facing us, and one which we cannot avoid by down-grading political freedom, is : how can we deal effectively with the problems of an industrial society and avoid creating a bee-hive in the process? It would be difficult enough with the clearest grasp of the reality of freedom, it will

be almost impossible without it.

Can we restore the sense of the interdependence of truth, person-hood and freedom? To put it another way: is it possible to make the value of the person-as-human intelligible in the context of critical social science? Nothing less will provide us with the kind of datum point upon which a truly effective critique of personal and social development can be based.

It can be done, I would argue, but only by rejecting the scientistic concept of criticism in favour of that employed in historical research and writing, on the one hand, and by expanding our field of vision to the universal experience of the human, on the other. We should aim not at the development of some great over-arching law-governed system, but at a methodology for the exploration of human problems which will be necessarily as dynamic as are the problems themselves.

Because we are in constant motion, new problems are continually cropping up. But they are never so new that the world-historical experience of the human is irrelevant to their understanding. At the same time the selection of materials to further that exploration will change as the problems and our view of that historical experience changes. The problem is, in a very real sense, the program and both are constantly changing yet in a continuing intelligible relationship with the total human experience. As Heraclitus put it: "becoming is a particular modality of being."

The necessary hypothesis is that human nature transcends time and culture at least sufficiently to permit the making of useful interdisciplinary comparisons. We must also assume that the triad of truth, person-hood and freedom forms a significant heuristic device for the critical comparison of persons, societies and cultures, and we must test these assumptions by disciplined research, thought and interchange. But to do this effectively an appropriately holistic epistemology must be developed.

Hoffmaster argues the connection between emotions and actions. I would extend the significance of emotional communication to include the understanding that precedes the action. Dilthey saw that the reconstruction of an historical personality involved the synthesizing of emotional and logical messages. The researches of Manfred Clynes and his work on the split brain have gone far to confirm his insights. If Dilthey is right, historical objectivity and its concomitant, historical criticism, is possible despite the fact that both involve emotional communication at the very core. I would suggest that he has provided us with an epistemological model which, properly developed, can serve the needs, not only of history, but of the social sciences as well. Such an inclusive mode of knowing would involve a new concept of objectivity which, by re-defining "fact" would effectively narrow, if not close, the fact-value gap.

The demand for some kind of postivistic confirmation of fundamental values was always an impossible one to satisfy. This is not to say, however, that quantification can make no contribution to our understanding of the human and, by extension, to our moral values. Far from it. But the value of the human personality can be proven neither by

experiment nor logic. It can, however, become intelligible when it is seen in dynamic interaction, through the media of human beings themselves, with two other values: truth and freedom. History provides compelling evidence for the proposition that freedom becomes possible when, in the name of an intelligible hierarchy of values, of which that of the human is the highest, conscience opposes power. It is this, as Epictetus said, that enables a man to look a tyrant in the face. The answer to Hoffmaster's question (p.18) as to whether or not sacrifice is required is, accordingly, a definite yes. Enlightened self interest is not enough.

As we move from an epoch in which the survival of cultures has been ensured by their relative isolation, into one which is witnessing the development --or imposition-- of one world culture, we face an insistent question: will this culture be a kind of materialistic homogenization in which technological order triumphs at the expense of the human? Can we do better? To do so is to recognize that civilization is the product neither of simple economic growth nor of unrelenting class struggle, but of the creative tension between power and conscience. But if conscience is to be creative rather than destructive, it must be informed by self-understanding. The field in which such understanding best develops is the universal experience of the human.

March , 1980.

SUGGESTED READINGS

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COMMENT: Egmont Lee, Director,
The Calgary Institute for the Humanities

on behalf of the Institute.

This comment is the result of consultation among a diversified group of scholars assembled by the Calgary Institute for the Humanities, who collectively participated in framing this joint presentation.

The Institute's working group was comprised of: B. Baker (Philosophy), J. Baker (Philosophy), A. Brannigan (Sociology), A. Colijn (Computer Science), A. Frank (Sociology), B. Freedman (Bioethics), M. Hanen (Philosophy), R. Jewell (Philosophy), K. Nielsen (Philosophy), D. Norrie (Engineering), M. Osley (History), D. Thompson (Environmental Design), and R. Wanner (Sociology).

In working out our submission, we have interpreted the collection of position papers, together with the covering material provided by Professor Hooker (Annex 1), as the raw material from which a priority granting program may eventually be constructed. We have attempted to compensate for what seems to us serious omissions and distortions in a possible overall program and would urge that in the preparation of a final submission to SSHRC these suggestions be incorporated.

First and most important, we strongly endorse the initiative to identify Science, Technology and Human Values as a priority area for research to be supported by the SSHRC. This field is of obvious importance to all modern societies, and especially to Canada in the 1980's. The relationships, both real and potential, between science and technology are an important and as yet ill understood aspect of modern civilization. They involve problems which are bound to be especially acute in Canada, where the number of productive scientists is small by comparison with the United States and Western Europe, and where the matter of translating scientific research into technological development can therefore not easily be left to the working of an "invisible hand", on the assumption that sooner or later the important connections will be made. Geography, climate, and history have made Canada into a country especially sensitive to technological developments. "Human Values" and perhaps even the survival of Canada as a nation are closely linked to technology in areas such as communications, transport, and energy. We therefore strongly commend the SSHRC for considering the launching of a close study of such developments over the next several years.

We are nevertheless somewhat alarmed by the comparatively one-sided approaches taken both in framing the overall structure of the proposal devised by Professor Hooker, and in the position papers which have been solicited. In particular, the three-tiered list of topics suggest by Professor Hooker (see Annex 1) seems to us somewhat skewed and in need of expansion. Also, among the

roster of contributors of position papers we were surprised to find well known scholars omitted, whose contributions would have helped to strengthen the case for the proposed strategic granting program.

In our view, an extremely broad range of problems must be addressed if a research program on Science, Technology and Human Values is to produce the best possible results. We would hope that concentrated research in this field can help us to reach a better understanding of fundamental issues, many of which are theoretical, as well as of the vast and subtle inter-relations between social and cultural developments on the one hand, and of science and technology on the other. The time allowed us is not sufficient to make specific recommendations in a systematic fashion. But the following topics should clearly be included as fields to be considered essential to a granting program in this subject area:

- History and Philosophy of Science and Technology
- Social History of Science, Technology and Medicine
- Critical Theory of Society
- Normative Ethical Theory
- The Intellectual Role of Scientists
- Descriptive Study of Value
- Theory of Social Change
- Theory of Rational Choice (and Critique thereof)
- Relations between Technology and Science
- Metaethics
- Moral and Social Philosophy
- The Impact of Science and Technology on Culture, Literature and the Arts
- Ideology and the Structuring of Scientific, Technological, and Social Problems to be Solved
- Systematic Study of Society (Social Anthropology; Sociology)

Research on science, technology and human values is not a matter for philosophers and social scientists only. If it is to be fruitful, it will necessarily involve a great many other disciplines as well. Several of the position papers, for example, make passing reference to the importance of a historical understanding of the development of science and technology, and of their impact on Canadian society. Characteristically, such references are brief, and their implications on what research should be conducted are not spelled out. We would urge that in framing the precise parameters of the proposed research program careful attention be given to the inclusion of historical studies, and of the study of the effects which technological development has had upon the formation of culture, primarily Canadian, but not excluding the experience of other societies as well.

It is clear to us, to cite only one example, that technological developments in transport, agriculture, and energy are key to the development of many parts of Canada, notably the North and the West. They have shaped not only social and economic growth but also regional cultures and mentalities, as reflected in literature and the arts. No comprehensive approach to "human values" and their relationship to science and technology can ignore these phases of social reality. We strongly urge that they be specifically identified among the fields of study recognized as germane to the proposed strategic area of research.

The holistic approach we are recommending is, in our view, particularly appropriate to a program of research to be supported by a body such as the SSHRC, whose terms of reference are wide and cover a broad range of disciplines. It would also ensure that cross-fertilization between academic disciplines may take place. The program would thus provide a focus for Canadian scholarship, and, one would hope, would pay off by way of improved scholarly communication across disciplinary lines, while also bringing individual problems into a more complex set of perspectives.

Finally, we wish to stress that in our view research to be conducted under the proposed program should leave room for both interdisciplinary team research, and for discipline-oriented individual scholarship. It has become clear that the integration of disparate forms of study is not always best achieved through the obliteration of disciplinary divisions. Often it may be more fruitfully pursued by frequent and extensive communications among scholars working within their several disciplines. Centres of advanced study, such as the Calgary Institute for the Humanities, may be instrumental in facilitating such an exchange of ideas.

We regret that, owing to the time available to us, these remarks are less systematic and comprehensive than we would wish. We should be pleased to participate in any further stage of elaboration of the proposed research program.

COMMENTS ON THE
LONDON, ONTARIO WORKSHOP

by

U.M. Franklin; W.H. Vandenburg

and

K.H. Ochs, University of Toronto

First, we would like to state our concept of the task.

We realize that SSHRC is considering the formulation of areas of research that are of particular national importance, such as the targeted research programs on aging that have already been set aside for special funding. We assume that the area of "science/technology/human values" is to be another such area of national concern in the context of special funding.

We assume furthermore that the purpose of the London Conference, of its preparation and of its follow-up is two-fold: It is (a) a mapping or an inventory of the type of research that would belong into the new area of national concern and (b) an attempt of establishing priorities within the subject matter as outlined in the letter of invitation we received.

Our interpretation of the reasons for calling this Conference may be in error and we stand to be corrected; however, we feel it is important to state our assumptions at the beginning of this discussion.

In reviewing papers and contributing to the discussion we are asked to address ourselves to the inventory and to the priorities in this given research area. However, while doing so we would like personally to voice our reservations to the idea of ranking and giving research priorities to particular problem formulations as far as Canada's funding agencies are concerned. It appears to us that healthy scholarships can only be assured if and when all research proposals are judged according to their originality, their conceptual approach and their novelty. Consequently, we have some real hesitations to establish priorities per se, although we will draw attention to areas of research in which we feel that inadequate attention has been paid to problems that would lend themselves to scholarly research and that this research could provide much needed information and insights.

We have undertaken to comment on papers by Drs. Stewart, Guédon and Knelman. It seems to us that they have addressed in a rather organic manner, three aspects of the task before us:

Stewart comments on the approach to the problem domain and essentially questions the limit of scientific research within this domain. She asks very perturbing and basic questions as to whether and to what extent the present cartesian approach to knowledge and human experience is a mode in which we can hope to solve some of our urgent problems; or whether, in fact, this very approach is one of the roots of the problems that we are encountering. Stewart's basic message is that the most necessary task is a re-conceptualization of the problem area. This must be accomplished by stepping outside of the framework of academic disciplines and sub-divisions and by transcending rather than solving the problems as they are presently formulated.

Implicit in Stewart's approach is the view that such re-conceptualization can best be accomplished by those already outside the mainstream of culture, be it the native people, be it women, or other non-members of the scientific establishment.

Stewart sees the Research Council's role as that of an enabling body, fostering deliberations rather than directing and focusing standard academic exercises. Thus, Stewart questions the basic assumption underlying the present approach, an assumption that expects more research within the currently established paradigms to solve more problems.

Stewart suggests that in order to resolve the question of how to proceed, it may be wise to ask, how we got into the perceived predicaments in the first place. Was it not by modern science and technology - or via la technique as Ellul would describe it - that the decisive roles were played? Was it not the development and application of highly specialized scientific and technical knowledge, based on rationalistic, reductionist and fragmented views of reality that got us where we are? Consequently, can any real problems of our society be resolved by developing more of the same type of research or by rearranging the proportions of the various strands of questionings by means of targeted research priority?

Our answer to the last query, is a clear "No". We must take Stewart's exposé of the hidden assumption utterly seriously if we are to accomplish something that will not end up aggravating our predicament in one way or another.

Even within the context of the present discussion we would suggest very strongly to lay down some considerations of the limitations of scientific research and consider what one can and cannot expect from such an approach. We would like to suggest furthermore, that the whole subject matter that Stewart raises be part of our answer to Council. If the problem area of science/technology/human values, as it is perceived here, will be part of an area of national concern, it behooves us to ask, why there are so many acute problems in this area and why, in fact, this has become (very rightly) of national concern. In other words, before thinking about solving problems, it may be wise to think why these problems have arisen. It is only through the understanding of the origin and the dynamics of such

problems that any fruitful approach to either clarify or solve them can, in our opinion, be achieved (Tester's emphasis on context is relevant here).

We feel that Professor Guédon has essentially looked at the problem area in a spirit similar to that of Stewart and to the spirit of our comments. He assumes realistically that academic research will continue to be funded and conducted and that the only contribution can be made at this time, is a redefinition of the problem domain; and with this a different approach to problem solving and to the research that provides background knowledge could be initiated.

We see much merit in Guédon's looking at science and technology as activities because this view not only challenges the suggested structure of the problem domain, but also makes it quite clear that the concept of value free science can no longer be sustained. It seems to us important that the old myth of objectivity of science or of knowledge not creep into any scheme that the London group might devise.

This is particularly important when one speaks of technological assessment, social impact studies or studies of risk. In this context it is essential that both researchers and those who look towards research for information or answers have no illusions of "objective knowledge" or value free science or scientists. It is also essential to remember that in many discussions of risk, the question of "what risk" is in fact disguising the much more important question of "whose risk".

Taking then, with Guédon, science and technology as activity, we understand his conclusion that such activities, because they lend themselves to increase the power, wealth and prestige of various groups, become very political acts. Thus the distribution of scientific knowledge is closely related to the issues of power, peace and social justice.

Like Stewart, Guédon views the activities of the Granting Council in this problem area as much more broadly based. If the Council were to focus on modes in which scientific and technological knowledge has been attributed - and could be redistributed much more equitably - the Council's activity would become enabling rather than directing. With this we agree and we would welcome such an approach. In this context we see great merit in applying the theory of property, by C.B. MacPherson, (Democratic Theory, Essays in Retrieval, Oxford University Press, 1973,) to science and technology. MacPherson makes a clear and analytical distinction between private (including state) property and common property. His theory is strikingly applicable to science and technology when one regards knowledge as property. In his analysis, private - including state - property is defined as a right to exclude others from the use and benefit of something, whereas common property expresses the right of all not to be excluded from the use and benefit of something. Thus, knowledge and information falls very much into a theoretical framework that leads to fruitful insights into the present problem areas.

Taking this view would also give added urgency to the arguments of Guédon to look into the appropriation of knowledge.

In the papers by Bindon and Knelman, we find the discussion of the particular manifestations in terms of social problems that occur within the domain under discussion and their analysis of them. It is of interest to note that both authors address themselves to the science/technology/society complex assuming apparently that values are given as part of the fabric of society. On the other hand, Knelman's extensive use of the concept of dilemma supported a particular type of value conflict. The standard Oxford dictionary defines "dilemma" as "argument forcing opponents to choose one of two alternatives, both unfavourable to him, a position that leaves only a choice between equal evils". This seemed to indicate Knelman's basic premise that only a change in values and priorities can un-dilemma a dilemma. This might be particularly well illustrated in his discussion of mal-distribution.

Knelman's paper is a very good indication of the global range of manifestations of science/technology/society problems and of the struggle by many scholars to find a uniform and more fundamental approach to their analysis. One of the major merits of Knelman's paper seemed to us his illustrative force and his broadly chosen examples. It is as if a very large number of puzzle pieces awaits to be put together into a coherent picture. It is our opinion that what is needed in the whole field is a very different and altered theoretical approach. This process could be started by raising and pursuing the kind of basic questions that Stewart and Guédon have introduced into this discussion.

Our own assessment of the problem area can be best summarized as follows. Following Ellul's analysis we believe that since the Industrial Revolution, society has restructured and reorganized itself into a new class of societies, distinct in all respects from traditional societies. This reorganization was necessary to make the new industrial modes of production possible. The process of reorganization corresponds to the "technicisation" of all spheres of human activities. People increasingly lived in an environment created by technique and they began to be socialized into this milieu. They internalized it by absorbing it consciously but also subconsciously. New values, new morality, new myths and new religious forms began to emerge, all of which are essentially indispensable for human life in this new milieu. Now people are conditioned in all these aspects by their milieu; they have never set down to explicitly design or research a suitable set of values, but these evolved from the necessity of the new social situation that started with the Industrial Revolution (see Vandenburg Culture as Social Ecology in press).

As the external situation and the technological society proceeds beyond the Industrial State, and moves towards a global set of technological systems, new and very grave problems arise. The past set of values does no longer offer a guide to deal with the new problems.

What is required now is a very critical analysis of the new and more complex technological system. At the same time, the position of values, old and new, as they relate to technology has to be made very much clearer. The solution for our problems may very well lie in the domain of values, rather than in that of technology or science. We feel that the major thrust

of scholarly work at this junction should be directed into the area of clarifying rather than modifying our problems.

As an aside we are surprised to see no discussions suggested on women and technology or on the real differences in the social values of men and women respectively. No impact assessment can hope to be valid without taking these factors, about which we know very little, into account (see for instance, Elise Boulding The Underside of History, Westwood Press, Bolder, Colorado, 1976, and her concept of women as workers without tools).

Finally, we would like to add a reminder as to some areas which, may be because of the particular social visions of investigators, have escaped scholarly curiosity. One is the demography of machines. Knelman eluded to machine population, and in 1975 one of us pointed out that while human nose-counting is a finely developed skill, no one seems to keep tabs on the birth or death rate of machines or on their migration and settlement.

We mentioned before the need to study the use of knowledge as private property and to investigate means of transforming this knowledge into common property. In the same vein, though the incompatibility of certain techniques and certain human values has been referred to by Knelman, Jackson and others, we know a few systematic studies that detail and document these incompatibilities. Nigel Calder outlined these relationships in a basic paper on "Science and Parliament" in 1964 (New Scientist, May 28, 1964, page 535,) but little more seems to have come from it.

Finally, while the techniques of the social assessment of technological projects are now being applied particularly to newly proposed development, (and methods in this field of specialization are being refined,) we know a few studies that have looked back and assess the capabilities of scientific techniques to derive future trends. Nevertheless, such work would be important, particularly in view of the questions raised earlier on the limits to the usefulness of scientific research in this area.

In 1964 the New Scientist asked a group of internationally known scholars to predict either the state of their own field of research or of an area that was of close interest to them twenty years hence. The World in 1984 was published as a book by Pelican in 1964 and it makes an interesting and humbling contribution to any discussion of the field of science/technology/human value.

All the major crises of the past 15 years were missed by the eminent panel. From the two volumes of individual essays, one could put together the World of 1984 as envisaged by the best minds in the intellectual community. This world is populated by Hovercrafts and people living in climate controlled mega-cities, all of them happy, all of them prosperous, all of them employed and well-educated, creatively using their ample leisure. It was thought that the birthrate in the industrialized western countries would increase between 1964 and 1984 and so would the cohesion of family life. "Home is becoming more absorbing, with its complex array of comforts, with the scope it offers in and out of the garden for aesthetic creativity with its 'moveable room' in the motor car. While the little world of home grows more intimate and cozy, it is not surprising that children make it easier than ever to turn this house into a home". The then Vice-President

(Scientific) of the National Research Council of Canada, sees Canada of 1984, with a population of at least 35 million, having solved its French/English problems and being more prosperous than ever. Science is central to this World of 1984 when a prominent scientist of the developing world foresees, "science will, of course, be the major force in the development of society in the next 20 years. Investment in science and technology will be greater than ever before, and consequently we may expect to see a considerable improvement in living standards throughout the world. The changes will be spectacular in those countries which are already advanced technologically and will lead to much better living conditions and more leisure. In the poor countries the rate of progress will no doubt be slower but when reckoned in terms of basic human needs, the changes will be no less significant. Furthermore, there is an increasing awareness in all countries that the plight of the less fortunate human beings is to some extent a collective responsibility and this is indeed a good sign. Altogether I think life would certainly be better in material aspects in the coming years". (Professor S. Chandrasekhar, Department of Physics, University of Mysore).

Finally, we cannot resist a quote from the pen of the President of the International Union for Conservation of Nature and Natural Resources, Professor Francois Bourliere who writes on the new balance between men and nature. Again the 1964 perspective looking at 1984. He writes, in the context of how people will live with nature and the need to preserve wildlife, "The industrial agglomerations of 1984 will thus have to include numerous parks and above all, there will be social forests surrounding them with relaxation and rest areas - natural oases where a number of wild plants and animals will be able to exist in the vicinity of the towns. In such a way men - himself the most precious natural resource to conserve in urban areas - will be able to coexist peacefully with some remnants of undomesticated Nature for the benefit of both. It is only by such means that our children will really be able to enjoy tomorrow, the fruits of the scientific and technical development of to-day."

One wonders whether it might not have been much wiser to read George Orwell.

Some remarks on the problem domain and upon a number of contributed essays.

Tom Settle.

1. I am glad the title of the domain was changed from "Science, Technology and Human Values". Partly this is because that title does not suggest any integrity to the problem domain, and without integrity to the domain it is hard to see how it qualifies for a strategic grant. But more seriously because the title encourages the lamentable separation of science and technology from human considerations which provides the problem. This, I take it, was GAIL IVERSON STEWART's point and she's right. There is a very serious social problem, a very serious human problem posed by the impact of science and technology on society when these are uncontrolled by interests of public good. I think the organizing problem of this domain is that of the threat to what is valuable posed by science and technology at the disposal of people who do not take care for the earth or their fellow men.

2. One of the central needs for research is the development of an adequate theory of objective value. I do not think the work suggested by DAVID BRAYBROOKE will suffice. His paper is very brave and insightful. Effectively it says we have not yet solved a single major problem in political philosophy satisfactorily. And I add, 'No wonder!' given that objective value is denied and that in general, if Arrow is to be believed, there is no ordering principle for deriving social choice from individual preferences. But the paper is accurate as to what needs to be done if his kind of philosophy is to make any contribution. But, I think his kind of philosophy is half the problem. I am not at all sanguine that a theory of preferences, needs, compromises and so forth will do. They miss the point that science and technology hurt us. This point spawns some very interesting research problems: In what manner and to what extent does our civilization or the nature we steward hurt under the impact of science and technology? How does this hurt arise? What institutions presently in place foster it? How could we forestall it or overcome it? Who controls science or who could and how? Ditto technology. What habits of mind in which minds foster damage and what other habits in which minds would be crucial to finding remedies?

These problem areas subdivide. Under the rubric "In what manner do we hurt?" are subsumed all manner of problems clustered around whether any values are objective, how one can discover what should be valued by a politician on behalf of his country, how one could weigh the hurt some suffer against the gain that ensues to others. Braybrooke's list of problems is subsumed here, and seen in perspective.

3. The finest paper of those I reviewed was S.R. CARPENTER's. Even so, it continues to amaze me how intelligent people still miss the point of ordinary people's criticisms of technology. Carpenter wants "the general public... to see technology as a part of the social and political fabric rather than as an uncanny unintelligible force". The point is that technology really does play the part of an uncanny, unintelligible force. Ask the people dispossessed of their homes or their land, or the people the fabric of whose social life is destroyed by technological innovations. They do not know what did it to them. And neither do we. We have not yet understood the force of technology. There is a vast complex of decision-making lacking coherence, whose resultant constantly does harm. Part of the research task is to render this complex more intelligible.

Carpenter's analysis of what he calls the "neutrality of technology myth" ("NTM") is fine if somewhat superficial. He should have shown how that myth in its turn is embedded in another myth: the myth that values are thoroughly subjective. According to this myth, we should not dare judge technology lest we impose our values (hollow hypocrisy) on others. Result: we impose the effects of our values on others while pretending to respect their values.

Carpenter's analysis of the fatal effect of positivism on the thinking of engineers is excellent and could only have been improved by a little more attention to the myth of the Subjectivity of Values. He gave hints now and again that he knew about that myth.

Carpenter's discussion of Alternative Technology is also perceptive and good. But his prognosis that we should attempt a merger of logical empiricism with hermeneutic dialectics is not realistic. I am sure he is right that we have to work at a philosophy of science integral to a philosophy of culture but not all the remarks he makes on this issue lead me to suppose he sees the depth of the problem of doing so. He is right that we need a critical articulation of the perception of technology as a form of life. The very idea of technology as a form of life is frightening. How one wonders, is the right treatment of each other possible in a civilization that breathes the technological spirit which anaesthetizes values? I think this is the major problem for our times. And I have friends, whose far sight I respect, who despair of it.

TWS:lmk
April 2, 1980.

The paradigms, perceptions and research practices of scientists and technologists have always been intimately linked to and constrained by their social and environmental contexts, a multitude of ways rarely glimpsed by the practitioners. Even in times such as the current period of environmental and social crisis¹ - when the scientific community is most obviously encouraged to reassess established priorities - there has been a persistent incapacity to take into account either the actual material and ideational relations between the scientific community and other social forces or the actual relations among those within the scientific community itself. Only recently in advanced capitalist societies have such limiting relationships begun to come under systematic, concrete scrutiny.² It is our thesis that deliberate efforts by the scientific community to re-constitute its research priorities will remain at a largely rhetorical and formalistic level until this community comes increasingly self-conscious about existing external and internal constraints on its practices. After reviewing the papers prepared for the conference which would appear most likely to address such constraints, we find little basis for optimism in this regard. Several of the papers do make significant assessments of current research orientations. In particular, Carpenter offers a succinct critique of the positivistic and ostensibly political mode of thought which continues to suffuse both the training and research programs of many scientists and technologists; while Knelman, in an understandably cryptic fashion, has outlined a generic set of problem areas and a suggestive inventory of analytic criteria and procedures. However, the connections of such conceptual limits and re-oriented research initiatives with the organization of both society-at-large and the scientific community itself remain opaque in all these papers.

We will have to limit ourselves here to indicative remarks about some of these contextual factors as they impinge upon the observations and proposals in these papers, followed by a brief list of recommendations that we would regard as more fundamental for conducting a thorough re-assessment of research priorities and practices in the realm of "science, technology and human values".

The Societal Context

Several of the conference papers deal directly with current societal issues. The authors offer inventories of the most evident contemporary ecological and socio-economic problems and crises, and provide some insightful comments on negative consequences of current social and environmental trajectories. However, from very different ideological perspectives on society, the authors are content to treat the underlying social forces which have generated these societal dilemmas in essentially rhetorical terms.

In spite of an increasing address to environmental crises and potentially fatal consequences, many scientists appear to adhere to the view that we live in a laissez-faire political economy and that just as soon as a majority of rugged individualists realize our right things will be alright. The deep historical connection between free-market liberalism and individualistic empiricist conceptions of knowledge and science in Western capitalist societies has been critically documented, but these elements appear to remain tightly fused in the dominant mode of thought of contemporary scientists.⁴ While adherents to this view may not give government agencies a substantial interventionist role - at least in society at large - not in the scientific community itself - the concentrated and centralized economic structures that now dominate our lives remain invisible. In fact, these structures and those people who occupy the upper positions in government, labour union and especially corporate hierarchies retain immense power and quite rigid, historically established objectives. If such structures should not be reified, their effects on both public dispositions and the scientific community must be taken into account in any genuine effort to re-assess research priorities. It should also be noted that a related tendency among scientists to depreciate the general public's attitudes as being "behind" those of institutional elites is contradicted

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 b. virtually every careful study, at least in the sense that those at the top of the corporate government and union hierarchies have generally been found to be more conservative than their publics.

In contrast to those who adopt the free-market perspective, Knelman's paper makes a number of allusion to "established power structures" both within and especially among nation-states. He also intimates a more dynamic and nuanced interplay between environmental setting, societal structures and public concerns, especially in his discussion of energy and economic crises as early warnings. But, particularly with regard to intra-societal relations, Knelman is no more inclined to specify actual social forces than are the free-market adherents. Knelman's approach is representative of a growing corporatist view of both society and science, but his "structured polity" remains as vacuous as the individualists' polity, and he appears just as willing as the latter to presume what the public's major concerns are and should be.

We would suggest that, despite the continuing promulgation of acquisitive individualist ideologies and the dominance of hierarchical social structures and controlling agents, diverse groups (e.g. social classes, ethnic and regional groupings) surely retain the capacity to identify public concerns that are both somewhat distinctive in terms of their respective generative social relations and also distinguishable from the currently hegemonic ideological forms; and, secondly, that sensitive empirical accountings of such public attitudes would be much preferred over presumptive assertions of "intelligentsia" as one of the bases for incorporating considerations of human values into decisions about the research priorities of the scientific community. This is not to suggest that scientists should or even could become empty-headed conduits for empiricist public opinion polls, but that, while becoming as cognizant as possible of the influences of hegemonic societal structures, they also consider the most sensitive available readings of the public's concerns as well as their own values and technical knowledge.

As a case in point consider Table 1 which presents preliminary results of a September 1979 survey of Ontario citizens.⁷ Whatever the limitations of such surveys as direct guides for policy makers, the expression of public priorities here does appear to be greatly at odds with both current government fiscal priorities generally and research funding priorities in the natural and social sciences.⁸ As a more specific instance consider the fact that for decades after survey after survey, including this one, have found the vast majority of Canadians to be opposed to any form of closer economic integration with the United States, yet federal government agencies such as the Economic Council have continued⁹ to spend large amounts for elaborate research studies of continentalist economic organization.

TABLE 1 PRIORITIZATION OF MAJOR PUBLIC CONCERNS

| <u>Policy Area</u> | <u>% ranking first or second for strongest claims on tax money</u> |
|--|--|
| Health and medical care | 53 |
| Public education | 24 |
| Job training | 23 |
| Job creation | 22 |
| Development and use of energy sources | 17 |
| Conservation of natural resources and pollution control | 13 |
| Retirement benefits | 13 |
| Maintaining public order | 8 |
| Welfare and public housing | 6 |
| Research for industrial development | 6 |
| Consumer protection | 6 |
| Incentives to private industry | 5 |

What then do public responsiveness and accountability mean to the scientific community? The fundamental limitations of most contemporary scientists in this regard, whether they adhere to free-market or corporatist views of science and society, are suggested by Hans Enzenberger.

"...their competence as scientists is limited precisely to the theoretical radius of the old ecology, that is to say, to a subordinate discipline of biology. They have extended their researches to human society, but they have not increased their knowledge in any way. It has escaped them that human existence remains incomprehensible if one totally disregards its social determinants; that this lack is damaging to all scientific utterances on our present and future; and that the range of these utterances is reduced whenever these scientists abandon the methodology of their particular discipline. It is restricted to the narrow horizons of their own class. The latter, which they erroneously regard as the silent majority, in fact, a privileged and very vocal minority."¹⁰

The Scientific Community

The scientific community, then, is a considerable potential social force in itself, and science qua the creation of scientific knowledge is finally being recognized not as a special, dependent entity but as produced by means of negotiation, the outcome of which depends essentially on the participants' use of social as well as technical resources. Michael Mulkey, for example, has recently shown how "cultural resources are taken over from the broader social milieu and incorporated into the body of certified knowledge; and how, in the political context of society at large, scientists' technical as well as social claims are conditioned and affected by their social position."¹¹ However, most scientists still appear to proceed as if their conceptual repertoires were indeed independent of their social context. That is, they tend to develop abstractions within the formalistic terms of special disciplines rather than the determinant terms of their historical and experiential setting.¹²

Hooker's problem domain taxonomy, which serves as the initial frame of references for this inference, appears to be a classic instance of such a formalistic abstraction. It is constructed primarily in terms of current scientific disciplines and techniques per se and without direct reference to the concrete social and environmental problems that science and technology research priorities are presumably intended to address. Exhortations to the interdisciplinary or interrelated use of such formalistic categories are not sufficient to assure their adequacy in the absence of more substantial consideration of and interplay with actual contemporary problems. Braybrooke's paper appears to us in some respects to be an even more extreme example of such formalism. On the one hand, some of the concepts he cites (e.g. "needs", "justice", "rights") are clearly identifiable with basic, concrete human concerns; but the applied method of theoretical development is clearly that of formalist philosophy and economics. It also clearly displays a laissez-faire naivete in seeing the independent choices of protective individual scientists per se as the optimal way to identify research priorities.

Sutherland, perhaps, errs to a different extreme by hypostatizing the formal structures and procedures of current governmental institutions and linking scientific practices to this concrete "reality", thereby effectively denying the social sciences' capacity to develop rounded determinate abstractions on their own.

Carpenter offers some very pertinent observations about ideological aspects of social relations within the scientific community. In particular, his critique of technological rationality and of the apolitical positivist philosophy underlying various scientific methods and classroom training are well grounded in his own experience with technology assessment efforts. However, while his experience also makes him relatively cognizant of the barriers to scientific co-operation created by technical specialization, Carpenter's appeals for synthesis and integration remain essentially at an idealist level with no address to the material organization of the scientific community.

To appreciate the actual organization of the scientific community, one must examine both overt and covert aspects of scientific work. People who work as scientists are subject to praise and often conflicting sanctions.¹³ These sanctions are seldom subject to direct accountability but occur with great effectiveness as part of the "shadow agenda". At a most general level for example, Sutherland's description of the limits of program evaluation and

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problem prioritization assumes that the social sciences are weak, lacking unity and authority or the ability to implement a grand scheme. This tendency to evaluate social science in competition with more authoritative, unified disciplines has contributed to the formalistic isolation of academics and scientists. As long as the sanctions of recruitment and evaluation imply a rather advanced quality to one mode of scientific work, people outside that discipline or occupation will not participate because they are not equals. Knelman notes, correctly, that a unified vision of social process is necessary for planetary unity. We can hardly call for this unity in the larger society when we are still committed to models of competitive, formalistic science and highly esoteric disciplinary languages. Until the formalistic isolation within and between disciplines is reduced from a dominate certification sanction to an embarrassing limit to be subsumed by a more extensive, dynamic perception and language of applied praxis-work, scientists can not expect to communicate effectively even with each other. But it should also be stressed here that a new genuinely interdisciplinary field of inquiry - such as "the human context for science and technology" could become - will be no means be able to avoid reproducing a formalistically abstracted character in itself, unless its scientific work is intimately grounded in the experience, interests and parlance of people who live in other equally important and honourable areas of society.

The technological assessment programs described by Carpenter had such potential because a variety of scientists and non-scientists were involved. As Carpenter notes, the considerable problems of communication across disciplinary vocabularies and with non-scientists indicates the pervasive influence of our scientific socialization and resulting needs and self-concepts.

Mason's intensive five-year study of an environmental studies institute¹⁴ offers one example of both the traditional disciplinary limits and the potential viability of research and teaching organized across disciplinary boundaries.

This study documented that people who respect an applied work unit as much as disciplinary maintenance can develop an analytical dialogue with other concerned persons. This same case study indicated that significant formal and informal sanctions occur to keep people isolated within formalistic discipline and sub-discipline perspectives. Such sanctions included: 1) few, if any, funding agencies were authorized to review or support inter or multi-disciplinary research; 2) graduate students and faculty experienced harassment and obstructions for involvement in "controversial" cross-disciplinary methods or topics; 3) interest in or recognition of contributions--presentations, publications, research--in cross-disciplinary work were limited, and hostility high; 4) employment for such work was minimal and tended to be "last hired - first fired" variety.

Throughout the scientists' career, she/he must constantly strive to understand and constructively resolve the many overt and covert demands that compose the shifting terms of personal, social, and professional "acceptability". This constant process of selective recruitment, confirmation, and promotion or rejection sustains the stratification of social and academic occupations, as well as the disciplinary limits on applied scientific work discussed by Carpenter. People, as they interact to protect their scientific identity and social prestige, enforce peer norms that are often in direct contradiction with their formal "professional" ideals. To constructively perceive, understand, and then attempt to move beyond these formal ideals, scientists must recognize that they do not represent natural, everlasting laws but social constructions often enforced by informal, political sanctions.

Science is inevitably a political process, not merely as it is practiced by some people. When particularly blatant abuses of the formal neutrality of science in academia occur to further narrow political interests, such as in the recent Varty case at the University of New Brunswick¹⁵, much of the scientific community may become rightfully indignant. However, the valid basis for such indignance is not the actual neutrality of science but the appropriation of science, even within the most remote sanctums of traditional disciplines, is inextricably bound up with political interests and consequences both for individual practitioners and for larger social forces.

We must recognize that scientific priorities are political norms intimately involved with existing societal structures. This recognition and subsequent accountability to genuine public concerns remains the promise of a critically self-conscious scientific community. 132

Recommendations

The following is a very partial list of steps that in our view would be necessary if NRC were to carry out a fundamental re-assessment of research priorities in the general domain of science, technology and human values:

- Immediately fund a number of major studies from alternative ideological perspectives of the historical and contemporary effects of Canadian social structures, and of internal social relations within the Canadian scientific community, on actual scientific practices and results in this country.
- Utilize the best available readings of public social and environmental concerns, along with collectively developed, concrete problem - based assessments by diverse scientists, as primary criteria for new research priorities; establish regional public advisory boards with rotating grassroots members to continually re-assess these priorities and help in identifying particular local research needs.
- Immediately implement more flexible, problem-oriented funding criteria to enable the fuller support of concretely based interdisciplinary research efforts, especially where such efforts involve the collaboration of natural and social scientists, and, even more importantly, where they involve science students in concrete experience and practice with community people.
- Develop co-operative funding programs with NRC and other agencies to support research on issues of social and physical environmental interplay and "cross-impacts".
- Begin to disseminate the results of major studies in more popularly accessible forms, while encouraging public use of the findings and feedback to such advisory boards.
- Subsidize advocate groups on key social and environmental issues to bring "storefront science" to the people, and facilitate the conduct of locally based research on the most urgent public priorities (e.g. occupational and environmental health hazards) with and by interest groups that are most endangered, concerned and previously deprived of the means to carry out such studies. 16

Notes:

It should perhaps be noted that these comments have been prepared while we were both participants in a particular moment of crisis, the mass evacuation of a quarter of a million people from the Mississauga area in the wake of the Nov. 11 train derailment and tanker explosion.

For a brief review and case study, see Livingstone and Mason "Ecological Crisis and the Autonomy of Science in Capitalist Society: A Canadian Case Study" Alternatives 8, (1) (Winter 1978-79). For general introductory works on some of the internal and societal constraints on scientific practice see, for example, S. Blume Toward a Political Sociology of Science, New York; Free Press, 1974, and H. Rose and S. Rose (eds.), The Political Economy of Science, London: Macmillan, 1976. Several of the most provocative case studies to date are P. Boffey The Brain Bank of America: An Inquiry into the Politics of Science, New York; McGraw-Hill, 1975, and S. Epstein, The Politics of Cancer San Francisco, Sierra 1978. A number of journals focusing critically on the social relations of the scientific community have also emerged in recent years, most notably Science for People, Radical Philosophy, Impascience, and Radical Science Journal.

An annotated resource bibliography is available from Radical Science Journal, 9 Poland London W1, England, at a cost of £ 1, 15p.

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3. As an extreme example, see H.R. Wynne-Edwards Terracy-Politics for a Planet San Francisco: Freeman Cooper, 1980, an extract of which was presented at the conference.
4. See especially C.B. MacPherson, The Political Theory of Possessive Individualism: Hobbes to Locke, London: Oxford University Press, 1962. See also R. Unger Knowledge and Politics, New York: Free Press, 1975, and A.K. Gjerring and C.A. Hooker "The Implications of Philosophy of Science for Science Policy". Unpublished paper, University of Western Ontario, 1979.
5. With regard to influences on public attitudes see, for example, Livingstone "On Hegemony in Corporate Capitalist States" Sociological Inquiry, 46, 3-4 (1976). Concerning influences on the scientific community, see Livingstone and Mason op. cit.
6. For a partial review, see Livingstone op. cit.
7. For further details see Livingstone Public Attitudes Toward Education in Ontario, 1979 Toronto: OISE Press, 1980.
8. For data on research funding priorities, see for example Statistics Canada and Ministry of State for Science and Technology R&D Expenditures in Canada, 1963-1977, March, 1978.
9. One of the most widely reported examples was the Economic Council's Looking Outward: A New Trade Strategy for Canada, Ottawa: Information Canada, 1975.
10. Enzenberger "A Critique of Political Ecology" New Left Review 84 (1974). Reprinted in Rose and Rose op.cit, p. 190.
11. Mulkay Science and the Sociology of Knowledge London: Allen & Unwin, 1979.
12. For clarification of this critical distinction see, for example, J. Banaji Capital and Class 3 (1977)
13. See, for example, Livingstone and Mason op. cit., and Mason The Critical Potential of Knowledge: The Matrix of Power and Environmental Studies, Ph.D. dissertation, University of Toronto, 1978.
14. Mason op. cit.
15. This case involved the "planting" of Dr. I.W. Varty, a New Brunswick government entomologist in charge of monitoring the environmental effects of forest spray program in the University of New Brunswick's biology department while his salary was paid by the very agency he was supposed to be monitoring impartially. For a journalistic account, see B. Deveaux "Deathspray" The Canadian July 7, 1979, pp. 2-5
16. In many of these respects, Science For the People is probably a more advanced and more instructive example than the much cited New Alchemists. See, for example, P. Bereano Technology as a Social and Political Phenomenon New York: Wiley, 1977, pp. 519-33

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1. PROLOGUE

This paper should be viewed in conjunction with Professor George Bindon's. While we are not uncritical of each other's approach and interpretation, we are in agreement that the broad field in which the theme of this project is set is now properly designated as Science, Technology and Society Studies (STSS). Thus our two background papers should be viewed as complementary. Professor Bindon has attempted to describe the field and the research problems and priorities intrinsic to the field while this paper is oriented towards those problems which are external to the field but closely attached in that they have major aspects which exist at the interfact of Science/Technology and Science.

2. BACKGROUND AND ANALYSIS

2.1. The Quadrilemma-Four of the Most Urgent Problems in the World

Today we can identify some of those problems whose scope and urgency threaten the survival of civilization. There are four most urgent problems in the world. To some degree we can even quantify the path of their development but as yet cannot predict accurately the timing of disaster. But as we do not yet have solutions they remain dilemmas, i.e. (1) energy/resources; (2) equity/distribution; (3) environment and (4) population with its special aspect of urbanization. They all represent "Malthusian dilemmas" (1) lodged in uncontrolled and unlimited growth. Due to the lag of the necessary mechanisms of social control both as institutions and belief systems, these dilemmas will inevitably lead to disaster. They are the "bombs" (P. Ehrlich) (2), "crashes" (G. Rattray Taylor) (3) and "traps" (K. Boulding) (4) leading to population explosions, ecological Armageddon, energy and resource wars or wars of redistribution as the have-nots fight for their share of survival. And the ultimate threat is that war becomes nuclear war. Maldistribution of consumption means maldistribution of health, wealth and justice. It exists within nations and between nations. The new communications have created the "global village" of McLuhan in the sense of instant distribution

of information and rising expectancies. But expectancy has risen much faster than fulfillment. Now there is a world drive by the economically developing countries to catch up to the still rising consumption of the developed sector, and to create, in effect, a new world economic order. The reality of this existing maldistribution of consumption is such that the vast majority of the people in the world may never catch up. World oil consumption, for example, would be 400 mbd. if the entire world consumed at the level of the U.S.⁽⁵⁾ . Current tensions are exacerbated by the reality that resources are not distributed in the earth's crust in accordance to the distribution of economic power, the cases of oil and uranium being most prominent. It is the geopolitics of oil now that is a major source of global confrontation.

The growing maldistribution of consumption between the have and the have-not nations of the world is critically divisive. It was the pivotal issue at the UN Conference on the Human Environment in June 1972 and the UN Conference on Food, Population, Habitat and the Seas that followed. When it is understood that each American in their life-time consumes about 40 times the energy and most major resources of that of a person in the Third World and that each Canadian consumes perhaps 30 times and that these countries continue on their manifest destiny of exponential growth, one then realizes that it is not possible for the Third World to ever catch up and one must accept that this maldistribution dilemma cannot be resolved except by drastic revolutionary redistribution systems. Together Canada and the U.S.A. with about 245 million people are equivalent to 10 billion Third Worlders in their consumption. It should be noted that this maldistribution dilemma is also characteristic of group disparities within nations. Unlimited growth is impossible for any biological species. But we have extended the concept of limits of growth to include environmental degradation and urbanization. It is true that the uncontrolled proliferation of nuclear power-civil and military- constitutes the major threat to global survival. Both are forms of "Malthusian dilemma". For the purpose of this paper we are treating neither separately. Nuclear energy is subsumed under the energy problem and the problem of nuclear war is simply outside the scope of this paper. However nuclear power-"civil and military" both constitute "Malthusian dilemmas", growing at rates significantly higher than the institutional processes and systems designed to mediate, regulate and control them, whether these be proliferation safeguards, waste management, reactor safety or arms control.

The great Western Energy crises are the first major manifestations of limits, although these are largely political and geopolitical. In the same way another dilemma in our quadrilemma is the problem of the global maldistribution of consumption between the economically developed and developing world. Here the dilemma is the difference in consumption rates and quantities and without a major redistribution coupled with a slowing down or levelling off in consumption in the economically developed world this dilemma is leading to global disaster.

The population dilemma is multi-faceted. Its broad¹³⁶ face is the maldistribution of resources, particularly food, with its increasing stress of under-nutrition and malnutrition among the poor, highly populated regions of the world. Population is itself maldistributed so that increasing numbers live in large urban centres incapable of providing adequate life support systems, plagued by cancerous growth and facing unsurmountable social and environmental costs.

Actually the "Malthusian dilemma" concept is not just applicable to the select sub-systems described but is true of the entire system. The systemic problem is one of complexity outgrowing control, noise outgrowing communication and disorder drowning order. This is the "macroproblem".

It should be made clear that these are not the only problems but seemingly the most urgent global problems. It will be our purpose to propose national approaches to solutions which will have global application, connection or significance. We will also not ignore secondary problems. But it is our belief that these, to a very large degree, are derivative and internal, although, of course, not entirely. It will be partly our task to weave the web of their inter-relationships. We have, as mentioned, deliberately chosen not to deal with the problem of war, particularly because we believe it is the problem of problems. Thus satisfactory resolutions of all equity problems will tend to remove the causes of war as it will also see the disappearance of the population problem. For these reasons we have chosen to translate the quadrilemma concept into the four major global issues - energy, environment, equity and economics, i.e. the four E's. This conforms to the real global agenda of issues.

2.2 The Problematiques

Since the first prestigious publication of the Club de Rome, "Limits to Growth" in 1972 it has become increasingly fashionable to enlarge the rather simple English word 'problem' into its more subtle and broader French version 'problematique'. A problematique is a statement of the underlying contradictions and conflicts upon which the large social problems rest. It is thus the problem of problems. Almost all analyses of problematiques relate in some fundamental way to the question of growth whether they are statements of limits or visions of sustained growth derived from the "technological optimist" curve. The Club de Rome's conception of the problematique was the impossibility for sustained growth in a finite world, the price for the attempt being collapse and crash.

A broader statement of this problematique would incorporate an extension of limits from limits to growth to limits to waste and to social complexity (Hazel Henderson's "entropy state") (6). This cancerous bureaucratization leads to high levels of social entropy. Even regulatory cures become disease causes i.e. cure-causing problems. Another form of the limits problematique is Garrett Hardin's concept of the "Tragedy of the Commons" (7).

In a world of limited resources (Commons) unequal access and exploitation (pollution/depletion) is destructive for all (the tragedy). Hardin's original solution, "mutual coercion by mutual consent", so pregnant in ethical as well as structural issues, has now given way to a professed survival posture, "lifeboat ethics". Here his naiveté is remarkable in that the majority in the water are already sinking the boats. Lifeboat ethics won't float as a survival strategy and moreover they are the real prevailing ethics and a major source of the problem of survival.

Still another statement of the problematique which indirectly incorporates the limits assumption is that by the United Nations Universities (UNU), Goals, Processes and Indicators of Development (GPID) project. Their statement of the problematique speaks of two dominant states of mal-development in the world-under-development and over-development. Behind this statement of the problematique converge various conceptual streams composing the new social paradigms of "small is beautiful" (Schumacher) (8), the "steady-state economy" (H. Daly) (9), "tools for conviviality" (Illych) (10), "conserving society" (Science Council) (11), "sustainable society" (Knelman and others) (12) etc. These latter notions are not merely ideas that have had their day but rather sustainable intellectual property in that they provide models of survival. Of all the research priorities in this field perhaps they stand at the top of the list, particularly as applied to a real regional segment of Canada. While they are development models they must, of course, include the resolution of the major dilemmas we have described and they must perforce be comprehensive social models. We must also be aware of the diversity of vision behind this common or converging vision resting on varying views of the problematique.

2.3 To Grow or Not To Grow

The traditional world view is that continued growth is necessary to fulfill all human goals. A bigger pie is thought to be the answer to equity. A smaller pie is thought to be the answer to environment. The simplistic assumption is that of a direct linear relationship between GNP and energy consumption or GNP and technology. Resolution could come from emphasizing growth in quality, i.e. by enhancing nutritional value or by making many small pies each maximizing quality. Nevertheless, the demands of population and consumption on the size of the pie will be profound. The depletion/pollution impacts will be equally powerful. And the demand for an equitable division of goods and services will go on unabated and perhaps indifferent to constraints or opportunities alike. One of the earliest studies to question growth was the Brooks Report (13). While enumerating the various costs of growth this report drew the seemingly contradictory conclusion that only more growth could cure the problems of growth. As usual, we discover that to grow or not to grow is never the question.

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Of all the debates the one concerning growth and visibility of societies based on continued growth has become globalized and dominant since 1972. The Club of Rome's three sponsored studies, "The Limits to Growth", "Mankind At the Turning Point" and "RIO-Restoring the International Order" have done much to stimulate the debate but none actually dealt with the alternatives. At the same time it is not possible to debate the growth question without dealing with the nature of contemporary technology. While each has its own intellectual and social history they are interdependent and most often intrinsically linked.

Critics of the first "Limits to Growth" study were an example of bedfellows making strange politics, thus ranging from the far left to the far right joined only by allegiance to an ideology of progress. There were, of course, multiple methodological attacks of varying merit but most often the critic was equally guilty of the same flaws. While Christopher Freeman accused the model of being the message, i.e. "Malthus in- Malthus out", (14) others used the Lockean argument of the "thin" data base, the weakness of the assumed relationships in the feedback loops and the non-probalistic nature of the predictive process (15). The technological critics noted the absence of salvation technology or a "technological optimist curve" which allows for the assumptions of continuous growth in efficiency, continuous substitution, the infinite resource base in the crust of the earth etc. (16). The economic argument also resting on technological optimism insisted that market mechanisms controlled shortages and that the drift to a service economy and public rather than private goods would solve the problem of limited growth. Ideological attacks affirmed their faith that Malthus had always been wrong in the past, that the proper ideology could solve the problem and that to freeze growth was to freeze inequity. The question was posed. Who pays the cost of slow or no growth? At the same time they counter-posed political violence and structural violence, the justice of formal legalities and distributive justice (17).

The political argument which affirms that in the real disaggregated world there are nations and regions which require growth is undeniable. This poses the dilemma of maldistribution and its apparent conflict with the ecological imperative. Must the rich become poorer for the poor to become richer? The question masks issues of values concerning the quality and quantity of life. There are countries in the world with half the energy consumption per capita of Canada and the U.S. (18) and nevertheless a wide range of superior social indicators (19). In organizing the need to redistribute given the wide range of consumption levels in the world there are implicit limits to the expansion of consumption in the economically developed world. But economic growth or production growth can never in itself lead to distributive justice, whether it is growth peddled by the West or the new elitist affluence in the Third World.

There are other aspects to the concept of the growth of limits that are important. These have to do with energy and communication. There is a thermodynamic law of entropy which in

its simplest sense means that in every transformation of energy some of the exchanged energy is irrecoverable as output and is lost to the environment as heat. It is always associated with conversions of energy to work. Entropy imposes an ultimate limit on global energy consumption, the threat being unacceptable climate change. The time scale of this limit could be of the order of 50 years based on present energy growth projections⁽²⁰⁾. There are comparable concepts of social and informational entropy.

Events have already imposed permanently lower growth rates on Western developed economics. Nevertheless there is no committed plan for an economics and politics of transition. Such a plan would probably incorporate a rate of growth sufficient to serve a reduced population rate of increase for a period of some 40 to 50 years of small but finite increase in population. The strategy of transition rests clearly on an approach to zero population growth, perhaps a "compression" economy,⁽²¹⁾ i.e. Oscar Morgenstern's concept of an economy serving the kernel of real needs and with all waste removed. Once again there is conceptual convergence with a number of streams, all, in one way or another, representing a social paradigm shift. A parallel development is the rejection of the reductionist, linear, technicist mode of thinking, such a movement occurring within science itself⁽²²⁾. Reductionism ad absurdum is being replaced by augmentative holistic thinking and by painting the observer into the picture.

2.4 Trend is not Destiny

It is not possible to settle the question of defining actual, i.e. operational, limits to growth without introducing assumptions which themselves reflect non-objective value judgements. Thus a "technological optimist" curve introduced into the Meadows model radically alters the output side of the analysis. Once technological fixes are assumed to be constant in time i.e. constantly available in the future, then resources tend towards the infinite. Merely assuming that all the minerals in the earth's crust and oceans (also on the moon) will become available at an acceptable social cost and a payable price in the future pushes the limits upwards dramatically.

On the other hand, limits to waste pose a problem which while they cannot be simply quantified are nevertheless amenable to analysis which can provide some reasonable order of magnitude. The technological and/or growth euphoric would argue that limits to waste are equally amenable to fixes such as massive recycling and efficiency or waste shipments into space. However this requires radical institutional changes and in both the concept of unlimited growth or unlimited capacity to handle the wastes of growth, the real limits may well be the nature of social institutions and social capacities to control and regulate human activities on a regional, national and international scale.

William Ophuls⁽²³⁾ has correctly defined this institutional adaptability limit in ecological terms, i.e. the "law of the minimum". This means the factor which limits the growth of a

complex dynamic system is determined by the critical resource which is least available. The capacity to manage human activities with the necessary associated institutions so as to extend the optimum yield principle into all options eludes us. The situation is even worse in that we are steering society through the "rear view mirror" and on a cybernetic information scheme which is suffering from a lock-in malfunction, responding almost exclusively to positive feedback. The result is confusing, the accelerator being the brake.

2.5 Indicators Should Not be Vindicators

The new popularity of social indicators research is undergoing a new wave. The problem lies in the limits of the quantifiable and the inevitability of soft assumptions searching for hard facts. However the research can be valuable if these factors are made explicit.

Various countries have begun to experiment with new more complex indicators (24) attempting to measure Net National Welfare (NNW) which subtracts the "bads" from the "goods". These should be applied to subtract gross national pollution in all forms - physical, biological and social from Gross National Product (GNP). But GNP itself will require new concepts of cost, price and value and in particular will have to include all investment in human resources or by human resources, i.e. from schools to households.

The preliminary and yet significant analysis of Mazur and Rosa (25) is an indicator of the value of new indicators. They did an analysis of correlations between national energy consumption and 9 health indicators, 7 education and culture indicators, 7 general satisfaction indicators and 5 economic indicators for 55 countries (available from UN statistics). The results are intriguing. While there is a threshold of energy consumption below which there is a clear positive correlation with all the life-style indicators there is a transition level of consumption (for clearly identified economically developed countries) above which there are no longer significant correlations. In other words, above a certain level of energy consumption further increases do not improve life-style (quality and quantity of life). In many cases negative indicators actually increase with energy consumption suggesting there may be an upper limit above which disamenities exceed amenities. It may well be that countries with less than half the energy consumption per capita of Canada have a higher quality of life without sacrificing quantity. Almost all socialist and communist countries have superior health and education distribution (26).

This study requires amplification and further quantification. There are indications, for example, in epidemiological studies on the impact of life-style on health that peoples living in non-market economies (27) i.e. far, far down on the scale of economic development, have cultural factors stimulating health. These studies also indicate how Westernization of their cultures enhances certain disease including psychological disorders.

Not only do we require expansion of the social indicator movement but we require that more meaningful indicators actually direct our decisions.

Social indicators, development models, energy/society scenarios etc. are all part of the planning mode. In a period of imminent social dislocation through shortages of critical resources we must be concerned with planning for survival.

Planning for survival would seem to have two faces, one being crisis avoidance and the other future creation. The focus of the first should be the development of contingency technologies, emergency preparedness programs and survival techniques geared to all possible forms of social disruption. The second face is the development of opportunity technologies, appropriate replacement technologies, transitional focused decentralization and diversity development. In both cases identification of vulnerability, targets and opportunity areas is essential.

We must also develop a dynamic inventory of capital stock, including estimates of life-times, costs and potential for replacement and improvement.

Finally, a major focus should be put on the continuity of social services - communication, information, education, recreation, health and civil protection. These are not only necessary conditions for survival but also tools for transition.

William Haddon Jr., (28) in a brilliant article on the hazards of energy transfers of all kinds, cites ten strategies for reducing harmful interactions of energy, people and property.

Only one of these is a pure strategy of prevention expressed by the concept "when in ignorance, refrain". The criteria for applying complete prevention is when the potential energy release is so large as to afford no meaningful resistance and the harmful effects are extremely costly in time and space. Then prevention alone becomes the exclusive strategy. We believe this strategy applies to both civil and military nuclear technologies. Despite the size of the threat in such technologies as large hydro-electric projects the impact in probability, in kind and amount of energy release and in terms of impact in space and time, would not warrant total prevention. It is for this reason that we argue for the total abandonment of nuclear power despite the realization that many of the strategies of limiting or restricting the possibility and effects of accidents have been applied, probability cannot over-ride ethics in this case because the rate and magnitude problem and the intrinsic non-accountability of effects and costs under nuclear power are unethical, save as an exclusive option to survival. That is, as long as we have other options, we must say no to nuclear power. A corollary is that we cannot say never. But a further corollary is that we must make every effort to keep our options open.

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In many parts of this paper we have affirmed the centrality of the development issue to almost all other problems. It might be of value to make a brief sketch of the notion of appropriate development.

2.6 Appropriate Development

The core of this project must reflect the priority and urgency of the global problems. Since we have argued that maldistribution as an operational issue is the most critical, the major thrust of our program must be to solve the problem of global inequity. This involves radically new concepts of international relations, and, in particular, a new mode of international development. Canadian initiatives toward solutions will have to concentrate on how to transfer appropriate development to the nations and peoples now suffering inequities.

Appropriate development is composed of a set of internal and external policies and programs. Both of these sets of policies will be guided by the unique cultural, geographical and geopolitical conditions for each particular region. But without international and reciprocal programs with other parts of the world it would be difficult if not impossible to achieve the goals.

The three main elements of these "external" programs are aid, trade and technology transfer. While there is a certain overlap in these concepts, their general definition is as follows: Aid is a recognition of global interdependence in the common interest of survival. It is not a gift of charity. Aid should be the anonymous transfer of surpluses of goods and services from global banks operated by the U.N. to those countries suffering temporary or critical deficiencies. Aid should be unconditional, non-repayable, and international. Aid should be supplied without influence and without strings. It may be goods, capital or services and its nature should be determined by the recipient nation. Much of the development of these concepts should be done in an Institute of Relevant Studies (IRS).

The development issue has been focussed on the growth debate but this is changing in large part due to necessity rather than values.

Canada should take the initiative for the establishment of a group of world banks administered by the U.N. These could begin with four basic banks - food, capital, information and technical. The latter three should be conceived within the context of appropriate development.

Trade, unlike aid, is the continuous exchange of goods and services on the basis of acceptable mutual rewards and needs between the trading partners. Trade is not purely economic but should involve, like aid, the building of a visible interdependence designed to optimize global security and survival. Canadian initiatives here should concentrate on the search for meaningful

trade with Third World countries rather than the usual division of spoils among the Have-Nations. Perhaps the nearest view of our development model is described in the series of essays "Another Development" edited by Max Nerfin of the Dag Hammerskjold Foundation (1977) which is described as "need-oriented, indigenous, self-reliant, ecologically sound and based on structural transformations".

The traditional instrument of development is technology transfer and capital. The instrument for appropriate development is appropriate technology. It is here that it is possible for major Canadian initiatives. The Brace Institute at McGill and John Todd's New Alchemists in Prince Edward Island are world leaders in this area.

Appropriate technology has five major aspects:

1. It is socially appropriate;
2. It is culturally appropriate;
3. It is environmentally appropriate;
4. It is thermodynamically appropriate;
5. It is humanly appropriate.

Appropriate technology and development will emphasize self-reliance but not to the exclusion of interdependence. Emphasis on indigenous material and human resources will be a natural consequence. Scale will be a variable in technology adjusting itself to optimizing economic benefits and vulnerability avoidance and the high costs of transportation and distribution. This will also be true of the level of decentralization. Within decentralized communities, centralized supply, distribution, recycling and re-use will be sought for their economies and efficiencies.

Criteria of appropriateness would themselves be a relevant research target. Generally speaking however social appropriateness might be measured by such factors as scale, degree of decentralization, degree of common mode, barter or shared use, levels of conservation and efficiency, the primary use of indigenous resources, human and capital etc. and the degree of participation and accountability. Indicators would have to be developed of course. Cultural appropriateness would be the degree to which the technology and mode of development related to the cultural values and norms of a community including its indigenous capacities while not offending against the environmental imperative. Environmental appropriateness would obviously mean that the development and technology was environmentally benign or low-impacting, non-alienating and resource conserving. Thermodynamic appropriateness could be measured more exactly by Second Law Efficiency i.e. converting energy to the maximum possible work. Human appropriateness would include such factors as being non-alienating and comprehensible as well as adaptable and being amenable to human control. These measures are extremely preliminary and fall into the social, environmental and quality of life indicators field (29).

Appropriate technology like appropriate development will exhibit high levels of diversity and decentralization in order to minimize vulnerability to major disruptions and their accompanying social costs. By definition appropriateness is modified by the total environment and the specific starting conditions i.e. life support capacity or carrying capacity etc. Thus appropriate development would be highly differentiated regionally. It would not ipso facto preclude growth but such growth would always be organic and intimately related to the continued availability of life support. It would tend to evolve to a "stable state" as limits became inevitable and necessary.

Despite this differentiation there could be two or three broad general models of appropriate development, correlated with the specific starting conditions and the communality of demographic, geological, geographical and development factors. A Canadian model of appropriate development could thus have a high degree of relevancy for countries such as Australia and the U.S. and to a lesser degree with Sweden, Norway and New Zealand. On the other hand, the principles are universal, thus Canada should also begin to develop a set of models designed for specific regions at various stages of development and with widely different physical and human environments. As suggested this entire concept of appropriate development and technology and the indicators by which it could be measured is an important strategic research area.

3. SUMMARY AND CONCLUSIONS

Our recommendations for research priorities derive from our focus on the problems of the four E's. It is in the multiple aspects and relationships of Energy, Environment, Economics and Equity that we should define our strategic research targets. Since we tend to believe that energy is the most powerful factor in determining many aspects of society including development and social and environmental impacts, we would place energy policy studies very high on our list of research priorities. Research in the above areas requires the use of such analytic tools as net energy analysis, cost-risk/benefit analysis, environmental and technology assessment etc. which are, themselves, research targets.

Energy scenarios designed for very wide public distribution and feedback and providing the social, economic and environmental implications of significantly different energy choices have proved an excellent public policy tool (30). In New Zealand and other countries or regions this type of study has influenced energy policy while satisfying the right of public participation and consultation.

Another interesting research study is inter-nation studies of energy use effectiveness. The assumption that economic growth is linearly dependent on energy consumption has turned out to be false (31). But what is more interesting is that among the economically developed countries there is an optimal energy use which is more highly correlated with a range of social indicators than energy consumption at levels above or below this range. This type of study requires much more investigation.

The potential for conservation and efficiency has been

widely studied (32,33,34). However the barriers to such ¹⁴⁵programs and policies require elucidation and a design to overcome these social, economic, attitudinal, price system obstacles.

In general it is our identification of the four major problem areas i.e. the four E's and the nature of the problem-
atiques which provide a focus for the recommended research areas. In summary the major problem-oriented research areas in the SSTs field are:

1. Energy: The transition from non-renewable to renewable energy resources together with a major commitment to conservation and efficiency;
2. Environment: To integrate environmental goals with our social, political, economic and technological goals;
3. Economics: To discover an appropriate form of development incorporating appropriate technologies for the achievement of a sustainable equity society;
4. Equity: To achieve an equitable distribution of health, wealth and justice within a scheme of appropriate development and including an obligation to international equity.

The most general reference for the context of this paper is my book (³⁵) which fills in the gaps and puts flesh on the skeleton of analysis.

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THE CONSERVER SOCIETY DISCUSSION: IMPLICATIONS FOR RESEARCH IN THE SOCIAL SCIENCES AND HUMANITIES

Ray Jackson

Over the past five years or so, the words "conserver society" to denote an alternative development for the future have entered the language of Canadian discourse on the great issues of our time. The term first arose in reports of the Science Council of Canada⁽¹⁾ but seems to have caught on, and spread not only in Canada but in other countries as well⁽²⁾. However, it would be a mistake to claim too great a national originality or proprietary credit for the concept. The problematique, or the problem matrix of the industrialized countries is so interlinked, so all-of-a-piece, that the diagnoses, and the prescriptions, tend to contain many common features. Thus the proposed conserver society, as a cure, finds itself one of a whole family of related ideas, with such names as appropriate technology, eco-development, sustainable state, voluntary simplicity, alternative development, and so on. At the same time, because of the circumstances of its origin, each term denotes a slightly different window on the world. I propose in this paper to explore the notion of the conserver society, as the idea has developed in Canada, primarily in the context of science and technology, and identify some of its implications for research in the social sciences and humanities.

No new social movement forms out of a clear blue sky. It always takes shape and defines itself in large part out of reactions to and in terms of the existing situation. So the notion of a conserver society has arisen in the context of what we have come to call the consumer society, as a reaction to its various excesses and the problems to which they have been giving rise.

The consumer society as a cultural phenomenon -- or, rather, as a dominant cultural phenomenon -- is relatively recent. Some⁽³⁾ would date its emergence with Keynesian economics, 30 to 40 years ago, when the doctrine became current that the secret of a healthy economy was to keep demand high, by artificial stimulation if necessary.

Others would place its origins two or three hundred years ago, with the opening up of the empty North American continent, whose resources seemed inexhaustible and whose vast environment seemed unpollutable. If one place became congested or depleted, one could always move on. It was the birthplace of "cowboy" economics⁽⁴⁾.

Some see it as a natural efflorescence of the industrial revolution, and particularly of the "mineral bonanza"⁽⁵⁾ that accompanied it and on

which it depended. The bonanza mentality reached its peak in the era of cheap oil (the last 50 years) and oil provided the crisis and the shock that began the difficult process of re-entry into the real world.

There can be no doubt that some of the impetus of the consumer society came from the survivors of the great depression of the thirties; vowing "never again" they sought, through the accumulation of material things, to put as great a psychological distance as possible between them and the unpleasant memory. We still see it in those who feel that maximum security in energy is to be obtained, not by finding out how to manage efficiently and "close to the ground", but by increasing all supplies to the maximum possible.

Still others trace the origins of the consumer society to the ethos of industrialization and that in turn to the Judeo-Christian ethic of man's domination over nature.⁽⁶⁾ And some would blame it, not on religion, but on the failure of religion, under the corrosive power of scientific rationalism, so that moral restraint and "higher" values were replaced by naturalistic gratification of the senses, and material success was the measure of the deserving.

Finally, the Olympian historian surveying the rise and fall of civilizations over millenia might attribute it simply to human nature, in that humans have always had the urge to push to the limits; when some members of the human race achieve affluence they are inclined to spend it by pushing the exploration of pleasure to the limits; in history this has often been identified as the period of decadence preceding collapse, the collapse following from the instabilities of inequitable distribution.

In any case, the result has been, for the generation acculturated to the philosophy of high consumption, built-in inflationary expectations of constantly increasing incomes, higher and higher GNP, and limitless horizons of affluence. The GAMMA consulting group, who did one major study of the conserver society concept,⁽⁷⁾ characterized that philosophy as the paradigm of the Big Rock Candy Mountain:

"O the buzzing of the bees in the cigarette trees,
The soda-water fountain,
Where the lemonade springs
And the coconut sings
On the Big Rock Candy Mountain!"

Unfortunately for those child-like dreams, the Earth, its biosphere, and the human race itself, have been protesting under the strain. One of the signals bringing this to our attention was the publication in 1972 of the book Limits to Growth⁽⁸⁾, commissioned by the Club of Rome, which used computer

modelling to predict various disasters of resource shortages and pollution within 100 years if population growth and industrial growth continue unabated. More immediately to hand, we sense in many dimensions of our present lives the approach to limits. Here I take limit to mean, not some precise and definite ceiling, but the entrance into a régime where cost and other problems begin to escalate markedly and returns diminish. We are not always aware of being in such a régime, because the escalation of stress is gradual and we tend to adapt to it. Often only a drastic shock will bring the situation to our attention so that we wake up and see that it may be time to seek an alternative path. On the other hand, intellectuals are given to hope that research followed by well presented argument will be sufficient to turn the trick and bring about a new insight. At least it is worth a try.

I propose to work my way through discussion of the concept of a conserver society in terms of various kinds of limits, trying to note as I go some of the implications for research in the humanities and social sciences.

Material Limits

Oil and gas. The major Canadian oil finds of Alberta 30 years ago passed their peak production about 1976 and, with a continuing increase in demand, Canada faces a growing cost of importing energy. The industry is now exploring in the inhospitable and environmentally vulnerable waters amongst the Arctic ice, and in the Atlantic Ocean off the east coast, in the path of icebergs. Extraction of oil from the very large Alberta tar sands deposits is beginning to appear "economic" -- although how much of the oil can in fact be extracted at tolerable financial, environmental, and energy costs remains to be seen. The desperate demand for oil in the U.S. is placing the ecology of the west coast at risk from tankers carrying oil from Alaska. The oil and gas industries, of course, are very willing to pursue these high-cost and high-risk resources as long as the rewards are sufficiently high and, indeed, the industries may actively encourage society to take that path. In the conventional economic paradigm all this industrial activity seems good, it means industrial growth and growth of GNP. No one seems to question the assumption that, if the oil is there, it must be got out, even though it is a one-time thing and not a real solution to energy needs. The new conserver paradigm, however, questions the rising social costs -- of prices, incentives, and subsidies, of possibly irreversible damage to native cultures and environment -- and suggests it is high time society discovered there is a much less costly route to meeting energy needs, that of improving the efficiency of use. A problem for social behaviour is that, while it is surely to the total societal interest to take the less costly route, it is not to the interest of particular individual actors. This points to fundamental philosophical and psychological questions: must or can our society work predominantly on the pursuit of self-interest? How much is that the result of beliefs or conditioning? What is the potential scope of altruism or collective human concern?

Forests. In Ontario, a province nearly twice the size of France, the forest industries have always been an important component of the economy. To many people, including some of the cutters, the trees seemed to go on forever. It was interesting to learn, therefore, within the last two or three years, that the last major tract of forest, 4.7 million hectares, but of doubtful recuperative power, was about to be leased, and that within the next two decades many pulp mills in other parts of the province will find themselves short of trees. Much of the problem is due to short-sighted management and inadequate reforestation. Growth is slow in the northern forests. The exploiters lack patience and, moreover, in some areas a small shift in climate has the significance that trees now in place may continue to grow, but new seedings will not generate and survive. Thus important issues are raised for resource management. Even in Canada, where we have grown up with myths of possessing vast and inexhaustible resources, we are discovering that non-renewables can be depleted, and renewables can reach the limits of sustainable yield. Beyond supposed "technical" questions of sustainability and tradeoff are moral questions. Does moral obligation apply only between persons, or is there also an ecological morality?

Lakes. The Great Lakes, which contain in one closely connected system five of the world's largest freshwater lakes (a total area of 245 000 sq km) were once bountiful sources of fish, and clean enough to drink. The upper two lakes, Superior and Huron, are still sparkling clear for the most part, but the lower three, Michigan, Erie, and Ontario, with the smaller Lake St Clair, are close to North America's industrial heartland. Industry after industry, and towns and cities, have been founded on their shores, each apparently believing that the effects of their untreated effluents would be inconsequential for so large a body of water. About ten years ago several species of fish in Lake Erie were noted to be dying as excessive eutrophication removed their oxygen supply during the night hours. About five years ago mercury levels in Lake St Clair were found too high and people were warned against eating the fish; and the herring gulls of Lake Ontario were ceasing to reproduce, because of rising levels of DDT and PCB contamination. Fortunately a body to negotiate such matters of mutual concern between the U.S. and Canada was already in existence, namely the International Joint Commission. The reactivation of that Commission, with the formation of a Great Lakes Water Quality Board and a concerted program for water testing and identification of the offenders seems to have arrested the decline of water quality, but the recovery time will be long. Ontario has some 250 000 smaller bodies of water that could be called lakes. Only recently Ontarians have been shocked to realize that acid rain, which they formerly thought was a European problem, is killing those lakes and 50 000 of them will probably be dead within 20 years. The acid rain comes mainly from coal-burning electricity generating plants in the U.S. and Canada, from smelters of sulphur-bearing ores, and from automobiles. Similar problems will begin to afflict Saskatchewan lakes and rivers in ten years or less if the expected scale of tar sands operations materializes in Alberta. The

issues raised by these examples have to do with the economics of "free goods", the management of a "commons", the politics of private costs as against social costs, and problems of inter-governmental regulation, all familiar to environmentalists and environmental lawyers. Extrapolation of present trends would imply an escalating burden of environmental costs and government regulatory costs, of inspectors, and inspectors to inspect the inspectors, as the industrial system presses to increase output while striving to meet competition by minimizing internal costs, unloading costs into the physical and social environment. The conserver viewpoint suggests that a re-examination of the industrial system would show many ways by which the same needs could be met with greater efficiency, lower throughput, less use of materials and energy, and inherently lower environmental impact. However, the means by which the industrial system can be brought to operate in that manner within the context of a highly motivated free enterprise society is a challenge for social design.

Waste Disposal. The city of Toronto has always disposed of its garbage by landfill. Now suitable sites are becoming harder to find and farther away. The public is raising objections, and transportation costs are rising. More efficient methods must be found. Trials are proceeding in the suburban borough of North York, of a plant for recovery of energy and materials from the urban waste. Disposal of toxic industrial wastes in Southern Ontario is becoming a serious problem, particularly since the experience of the Love Canal, near Niagara Falls, N.Y., illustrated the hazards to human health of past practices of pouring liquid wastes on the ground or in pits -- or even of storing them in steel drums which inevitably corrode in time. Such poor housekeeping practices, in the name of industrial "efficiency", should never have been acceptable, but they are becoming less so now as their effects cumulate, as our knowledge grows, as public awareness rises, and as techniques improve for medical diagnosis and for the detection of environmental poisons. Urban waste disposal problems, for cities above a certain size, are almost independent of the "emptiness" of the land around, being determined rather by the high volume of waste, and the distance that must be travelled to get outside the congested metropolitan region. The uninhabited northern tundra does Canada little good as wastebasket for its large cities clustered in the southern belt. All of this spells the end of the once-through society. The language of "waste disposal" has to become obsolete as we move to closed cycling systems.

Ecology. Over half of Canada's cropland is found in the prairie provinces, and is dry grasslands, suitable for grazing and for the growing of wheat and other cereals. Suitable genetic stock and efficient techniques have been developed to get good yields in spite of a short growing season, with the result that this area is not only Canada's breadbasket, but exports wheat on a large scale to the rest of the world. Wheat is thus an important item in Canada's trade, and a major source of income for the Western farmer. Because of

those incentives, it would be surprising if one did not find a considerable pressure being placed on the grasslands ecosystem, and indeed it is so. The initial high fertility of the grasslands soils, a legacy of the retreat of the glaciers, is more and more being maintained by artificial inputs. Over the last 70 years the "native soil productivity" has dropped by half, mostly due to loss of organic matter. Present practices are likely not sustainable in the long run, the costs of the artificial inputs are rising, and the re-tracing of steps to a "natural" or ecologically sustainable agriculture may now be impossible. The original long-grass prairie ecosystem has essentially been destroyed already; efforts are under way to try to preserve at least one reservoir of the short-grass plains ecosystem as a national park in southern Saskatchewan and Alberta. Industrial-Age once-through agriculture may become a thing of the past and, if so, diverse naturally-evolved ecosystems in working order, representing the investment of centuries, will be appreciated as extremely valuable resources.

Economic Limits

Canada, in common with other industrialized nations, is experiencing a slowing of industrial growth, relative to the trends of the last 30 years. At the same time, it suffers from inflation, high unemployment, and diminishing returns on capital investment. Political and popular beliefs continue that high rates of growth are desirable, but policies designed to stimulate growth are inhibited by fear of making inflation worse. Current fashion is to blame government regulation and intervention, and to hope that by cutting back government spending, and turning resources back to the private sector and free market mechanisms, the problems will cure themselves. The examples given in the section above, however, suggest that such a move may prove futile. The high-throughput form of industrialization is pressing the limits of environmental and social impact and, under such conditions, further growth of the same type is likely to bring with it an increasing overhead of regulation costs, social costs, transaction costs, and unaccounted externalities, so that, though GNP continues to rise, the Quality of Life, or Net Human Benefit, may not. One of the first priorities for economic research should be to develop better indicators of social wellbeing. Growth (improvement) in new dimensions is surely possible and greatly to be desired, but we are unlikely to get it so long as policy-makers continue to act on a basis of misleading indicators.

Social Limits

The continued drive to raise production and incomes in industrialized countries imposes social stress of various kinds: high efficiency through mechanization and automation improves conditions for some workers but displaces others into low-skilled unsatisfying and alienating jobs; the drive for high levels of activity, consumption, and income leads to neglect of other

activities, such as those in the voluntary and domestic sectors; market-contracted activity, e.g. for child care, tends to replace voluntary, to the frequent detriment of familial and love-relationships; high rates of change, along with the above factors, lead to instability in human relationships, and thus to broken homes and psychological problems of children and teenagers; large-scale impersonal technological systems for banking, food marketing, information and other services alienate and breed indifference in the customer, and tend to increase vandalism, shoplifting, and other types of crime; the frenetic general economic activity, the constant drive for change and growth, the high intensity communications environment, tend to erode the sense of security, shorten the attention span, reduce the ability to enjoy leisure, create dissatisfactions, and result in many forms of social breakdown, paralleled by a rising consumption of alcohol and tranquilizers. In many cases, as in the competition for "positional goods" (9) -- a college degree, a peaceful country cottage, a motorboat -- the effort may turn out to be in vain; the person who already has one may have to work harder to maintain his amenities, while the newcomers may find their relative advantages little changed and the achievement hollow, since the situation has been made worse for everyone (except the last arrival). These symptoms of social stress are familiar to all highly industrialized countries and, though difficult to quantify, indicate that economic growth, at least as usually defined, has limits in terms of the good society. Though most of these societies feel that they are better off than at some time in their past, it is clear that a régime approaches where continued gains in some aspects (e.g. the quantifiable or the marketable) are achieved only at the expense of losses in others (which may be non-quantifiable but more important). What is the Good Life?

Institutional/Governmental Limits

As a country becomes more populated, and as the power of its technologies increases, the impacts of people on each other and on their environment increase and must be regulated (by common consent). This has already been noted under the heading of economic limits. Canada does not escape the problem, in spite of its small population and large area. Most of its population is concentrated in the southern strip of the country, and is highly urbanized. Only 13 percent of the land mass is arable; within that, agriculture is concentrated on the most favorable areas for soil, water and climate, and in some regions, such as British Columbia, these areas are particularly limited. In the North, while population is sparse, so is the carrying capacity of the land. Ecosystems are delicate and slow to adapt, and require government survey and protection. International impacts grow, on our 200-mile fishing zones, on our coasts from oil spills, on our forests, lakes, and air from U.S. pollution as well as our own; even the climate is being threatened, by carbon dioxide from the world-wide burning of fossil fuels. Demand for social services is rising, for medical and dental care, old age pensions, unemployment insurance, and so on. The

costs of government show in the tax burden which citizens find increasingly onerous. As the functions and levels of government grow, the inefficiencies of bureaucracy grow even faster. Unless our society can devise some better way of governing itself for the common good, we shall find such bureaucratic/institutional costs imposing an ultimate limit on our ability to carry out our prime economic functions. Alternatively, as the conserver mode might suggest, can a more modest and ecologically more sophisticated lifestyle reduce the need for government?

Governments find another limit in the policy tools with which they have to work. If commonly accepted ideas can be regarded as social institutions, then the inability to conceive of the needed new ideas within the accepted conceptual structure can be seen as a form of institutional limit -- perhaps not a permanent one, but a real enough one at any given time. Governments seek to control inflation by creating unemployment and by raising bank interest rates, at the same time as they try to reduce unemployment by providing incentives to investment in capital-intensive (labour-minimizing) technologies. They try to solve or to avoid problems of distributional inequity by stimulating more growth in the sectors that are already well off. To break out of the walls of established ideas and seek new solutions to new problems or to stalemated problems, governments create advisory institutions or think-tanks, then, to be safe, muzzle them with governing boards representative of all the vested interests. Trying to remain within the prevailing "credible" framework of thinking, governments go around and around with the same old remedies that long ago ceased to work. By what institutional redesign can government be rendered intelligent and adaptive enough to cope with the modern world?

Political Limits

In the usual industrial pattern of growth, capital investment and growth tend to flow toward a centre, which gets richer and richer, and may or may not pull the periphery up with it. The usual hope is that, as the total pie grows, everyone will become better off. However, this may not happen and relative disparities may become large, in which case redistribution becomes a serious political concern. As Mesarovic and Pestel pointed out in their report to the Club of Rome⁽¹⁰⁾ the political tensions created by large disparities may be uncontainable and may present limits to that pattern of growth. In Canada, as a matter of history, the various regions have tended to be dominated from the industrial and financial heartland, centred in the province of Ontario. But Canada is a geographically spread out and diverse country, development has been uneven, the balance has been shifting, and the various regions and provinces have been growing restive. As the provincial governments have gained in strength and competence they have increasingly challenged the authority of the central government in Ottawa; they seek alternative ways to develop

their own regional economies and cultures against the centralizing tendencies. Canada is ethnically and politically diverse as well; no one political party at the federal level even approaches an even representation from different parts of the country. The consequence is that one senses a growing problem of governability -- the inability of central government to take decisive action on matters of importance. Canada is not unique. The situation is similar in other industrialized countries, where development has brought about a specialized and articulated pluralism of powerful interests, and affluence has spawned a diversity of goals. Unless some coherent outside threat to national security can be identified, a national consensus on priorities seems not to exist. In what sense the evaporation of central governability constitutes a limit to growth may be debatable. It may only constitute a limit to patterns of growth as we have traditionally conceived them, and in fact new dimensions of growth currently taking root may be facilitated by greater regional diversity and autonomy.

The situation within Canada mirrors the situation in the world at large, where region after region is seeking alternatives to the centre-periphery pattern of development⁽¹¹⁾, and world government by two or three central power blocs is diffusing to many centres and diverse dimensions of influence. The research suggested by the conserver society concepts, even though the concepts were developed for an affluent country, will have much in common with research on other "alternative development" ideas being explored world-wide for the developing world; all seem to favour ecologically harmonious development, technology appropriate to the particular circumstances, and a self-reliant decentralized approach. Just as in other countries, the ideas are being taken up in some regions of Canada, as offering a possibly feasible path to development for regions bypassed or disadvantaged by the central industrial system.⁽¹²⁾

Human Limits

Finally, it seems that, to some kinds of growth, there are limits that follow from the nature of the human individual. The time and attention of the human being are limited. The great religions have always known this, and have always taught that spiritual progress is hampered to the extent the person is preoccupied with material possessions. In modern psychology, Maslow⁽¹³⁾ suggested that human needs can be ordered on a hierarchy, and as the more basic needs are sufficiently met, the attention naturally tends to shift to "higher" less material needs. However, this progression can be retarded by a culture that encourages a fixation of attention on the lower needs, turning them into fetishes. As we know, commercial advertising in North America continues to urge the consumer into expecting to find the satisfaction of basic personal-relational needs in the purchase of still more material goods⁽¹⁴⁾ and moreover creates false needs or wants by inventing previously unheard-of threats.

In terms of economics, and the relation between production and consumption, the human time limit imposes a definite constraint.⁽¹⁵⁾ Even though, through automation, the output of material goods per man-hour might in principle be increased almost indefinitely, the time to use and enjoy those products remains fixed by the length of a day and the length of a human life. In the affluent "consumer" society many people have a surfeit of possessions they rarely have the time to use and certainly not to repair or maintain. In industrialized countries generally today, as revealed by public opinion polls,⁽¹⁶⁾ the sense of enough-ness seems to be growing, with "more" not being worth more of the hassle and stress of the modern high consumption society.

The possibility of natural human limits to consumption is important because it offers hope that high material consumption in the developed countries may slow down for its own internal reasons, and in fact may already be doing so -- except as resisted by various commercial and bureaucratic agencies that have a vested interest in their own growth. Encouraged and given a chance to work, the internal person-centred controls that are already having some effects may moderate the severe pressures against the various limits sketched previously; otherwise the escalation of efforts to cope may well lead to the desperate authoritarian political scenarios envisaged by Heilbroner.⁽¹⁷⁾ If such a natural slow-down should in fact be what is happening, then we need research in appropriate public policies, because certainly at the moment our politicians, businessmen, opinion leaders, and our government policies for economic growth, social services, employment, industry and trade are quite unprepared.

Another kind of human limit enters with regard to the sphere of knowledge, through what we call the information explosion.⁽¹⁸⁾ The growth of education, population, and forms of more and more rapid intercommunication has increased what we might call the noetic density to the point of saturating, not only many of our scientists, but many of our nodes of decision-making, at all levels from individual citizen to leaders of government. Decisions become more capricious than rational. New systems of management, governance, and communication have to be worked out, along with policies for the ethical and intelligent use of powerful new communication technologies.

The Conserver Society

Out of the above matrix of "limits" into which the wave of industrial revolution is slowing and maturing, comes the concept of the conserver society. In its most fundamental sense it represents a change of attitudes from those appropriate to a world of open-ended growth, to those appropriate to a finite closed world. To paraphrase one of the better known Friends of the Earth, much follows from the round-earth theory.

To summarize, the conservor society appears as an integrative concept, bringing together a concern for the environment and ecological relationships; a sustainable use of resources; efficient design for recycling and low waste of materials and energy; an emphasis on efficiency of use, and questioning of demand, rather than a maximizing of throughput and material growth; a belief in diversity of approach and appropriateness of technology to local circumstances; and a preference for decentralization and the use of local initiative. It recognizes the need for industrial systems to come to terms with the ecological context; the tendency of market systems to over-sell; the tendency of industrial and market systems to follow their internal imperatives to larger and larger scale, eliminating diversity and creating dependency; and it recognizes the need for policy to be guided by a more total social assessment of benefits and costs. Whether all these aspects hang together and are necessary consequences of related causes, or necessary parts of a coherent solution, are far from being worked through in any detail. It is the same as regards the implications for legislation and for government policy. Most writings so far have remained at a similarly general and somewhat superficial conceptual level. (19)

Further Reflections on the Implications for Research

Aside from direct research in the physical sciences into the efficient use of materials and energy, solar energy, ecological agriculture, biomass (pay-as-you-go) fuels, and so on, most research implied by the conservor concept is bound to be interdisciplinary in nature because, though it may be concerned with everything from psychology and anthropology to economics, politics, and philosophy, it must always retain a relationship to the ultimate question of how well man can live within finite planetary resources. Some topics that suggest themselves for further study follow.

The Re-Definition of Growth. Though the conservor concept is clearly against continuation of indiscriminate growth, growth for its own sake, or growth of the GNP regardless of what it means, it is clearly in favour of continued human development and improvement in quality of life, much of the improvement being gained through the appropriate use of science and technology. Implied here is a questioning, at least for industrialized or "mature" countries, of the supposed necessary connections between industrialization, living standards, GNP -- and the throughput of materials and energy. What is undoubtedly a fairly firm correlation up to some stage of development, ceases to hold at higher levels, especially when the society begins to shift its composition of technologies, introducing more sophisticated technologies based on the biological sciences, ecology, and microelectronics. In such a transition energy consumption may even decline, though invention, business, building and re-building will surely continue. Implied here also is a questioning of the meaning of GNP, income, and other indicators, in relation to human needs and goals. As various material growth components reach the point of

adequacy and begin to slow down in the industrially mature society, what continues to grow, and how does it show in social or economic indicators?

Social Dynamics. Why do people over-consume, waste, and behave in short-sighted self-interested ways? It is not the same in all societies. How much has to do with basic human nature and the social structures in which people find themselves, and how much is a matter of education, conditioning, and propaganda, including advertising and television and radio programming? How much is due to conditions of rapid growth and social change -- as against conditions of security and social stability? How much wasteful consumption follows from the structure of the welfare state (or the impersonal corporate state) which leads people to feel that the goods are free, or collectively paid for and therefore characterized by high disparity between private costs and private benefits?⁽²⁰⁾ How much is, in a way, philosophical or cultural, being caused by an excessive preoccupation with market economics?⁽²¹⁾ How much depends on the locus and control of power in the society, and the processes of capital accumulation, e.g. the relative benefits and power of producer relative to consumer? How much is simply a question of shared values, morality, and ethics? Is it true, as W.L. Gardiner suggests⁽²²⁾ that the consumer society has its roots in behavioral psychology, which conveyed the paradigm of the human being as object, and therefore something to be manipulated? The newer movements in academia toward a subjective or humanistic psychology, he suggests, convey a conception of the human being as free, responsible, and having intrinsic worth. This tends to give a higher priority to internal psychological needs and intimate relationships, and seems more consistent with the idea of a conserver society, controlled by the consumer-citizen in charge of his own needs, with a right to privacy, as against a society being manipulated by the production system to its own interests⁽²³⁾. It seems to be related as well to the thesis of Settle⁽²⁴⁾ who insists on the concept of the moral autonomy and the moral behaviour of the individual as essential to the design of the good society, and condemns utilitarianism (and the theory of liberal capitalism) for trying to do without it.

Technology and Social Form. Several social philosophers, e.g. Mumford, Ellul, Roszak, have commented on the ways in which a society expresses itself in its technology and the way that the technology, in turn, shapes the structure of society. We see now those philosophical observations having some very practical consequences for making the transition from a consumer to a conserver society. Nuclear power has been pointed up as the archetype of a centralized, capital-intensive, "unforgiving" technology which by its nature leads to waste, high consumption, centralized elite management, and law-and-order political regimes.⁽²⁵⁾ In contrast, "soft energy paths" tend to be economical, environmentally benign, uncatastrophic, and appropriate to distributed democratic decision-making.⁽²⁶⁾ If we have any doubt as to the way a technology can shape lifestyles, determine social form, and build in waste, we have only to look at the automobile. Thus these questions of technology assessment, and the implications of exercising technological choice are highly relevant and in need of study.

New Economics. Conventional "growth" economics has tended to ignore the detailed implications of technologies and of resource constraints by the use of various convenient assumptions and axioms, such as "technology will find a way", "human needs and wants are infinitely expandable", "work will expand to occupy idle hands", and "the market will decide." Though these aphorisms each contain some germ of truth, they can hardly constitute an adequate axiomatic base for the new economics appropriate to a finite world, or for a conserver society. What should a conserver society economize? To answer that we shall have to look to concepts like those of Georgescu-Roegen⁽²⁷⁾, and the notion of entropy as the basis for a theory of value rooted in the real physical world. New thinking is being done on the economics of the steady state⁽²⁸⁾, on resource policy and the appropriate valuation of depletable resources⁽²⁹⁾, on the diseconomies of large scale⁽³⁰⁾⁽³¹⁾, on the problems of distributing work and income in a slow-growth economy, on the informal and/or domestic economy and the distortions of marketization,^(32,33) on the post-industrial economy,^(34,35) and so on. Much more needs to be done in Canada before the new thinking begins to prevail and is reflected in policy.

Development Theory. At the same time as ideas such as the conserver society were growing within Canada and other industrialized countries, new concepts were entering the thinking about world development. The virtual impossibility of raising all countries to the levels of resource consumption and waste obtaining in the industrialized countries was beginning to be appreciated, as was the desirability of not repeating some of the industrialized countries' mistakes, e. g. in environmental deterioration. Principally, however, the less-developed countries were becoming persuaded that past development patterns, and theories, tended to create dependency, and actually to increase disparities -- between countries and, within countries, between urban and rural regions. The LDC's began calling for a "new world economic order", with more equitable terms of trade, and a more decentralized and self-reliant approach to development.⁽³⁶⁾ The developed countries must do two things: they must cure their own growth-related problems; and they must set an example of economy and moderated consumption that can serve as a more feasible objective for the rest of the world. This is the way in which the conserver society concept can be seen to be very closely related to the new models and approaches being studied and advocated for the less-developed.⁽³⁷⁾ The nature of the relationship, its consistency and/or its complementarity is worth further exploration.

Technology and Employment. If industrialization continues on past trends, it leads to a more and more highly organized corporate state in which highly efficient production requires a workforce dwindling in numbers but escalating in skills, while increasing proportions of the population are left dependent on the system but with little or nothing to do of much importance in a materially

productive sense. Social problems, alienation, loss in total efficiency, pockets of poverty, and probably coincident unemployment and inflation, are outcomes of this incomplete and unbalanced use of human abilities. The conserver society concept would join other current movements in seeking to redress the balance toward person and community as against solely the material efficiency of the system itself. The use of appropriate technologies can support diversity, improve people's participation in the social process, and can promote a greater self-reliance and feeling of self-worth. The result of better distribution of personal and community contribution and responsibility may well be a higher total productivity. This should not be the primary aim, however, unless at least it is understood that the outputs in terms of which the social productivity is measured are not only material but include many intangibles -- such as, for example, satisfying human relationships, true leisure, and the feeling of self-worth mentioned above. This approach to a balanced employment structure, and its consequences for regional development policy, appear to need research.

Conclusion

If this essay seems to have covered a lot of ground, over many disciplines, perhaps the reason is this: the conserver society concept says "this is the way the industrialized world now has to go." Therefore the implications for research are almost as broad as civilization.

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COMMENT

There are three dimensions which, I feel, did not really get the attention they should have had, when trying to define 'society', and 'human values' for the future, in the context of the assessment of research priorities for funding.

The first dimension is one of an international or global nature concerning the 'options' for development (or simply for 'further evolution') in view of the relationship between global problems and challenges as well as the international economic structure, the armament civilization, and the national development 'problematique'.

Today, there seems to be a general recognition that 'over' and 'under-development' are part of the same process at the world level and, hence, intimately linked. 'Development' has been defined traditionally by, or been considered synonymous to, the state of affairs in the industrialized countries. One has to realize that the "North" (by 'North' is meant the industrialized countries) is also in the midst of a 'development' crisis which is shown, among other things, by simply the absence, despite high growth rates in the past, of generalized prosperity, (i.e., the presence of important 'pockets' of absolute poverty varying from 15-35 p.c. of the population in our countries); by the continuing impoverishment of a large number of people, mostly among the young; by an unsustainable waste of resources, material as well as human; by the progressive destruction of the environment and natural resource base; by the alienation and the sense of inability to influence meaningfully one's life; by the growing number of mental illnesses (which may be due to the lack of a perceived purpose in life); by the signs pointing to some kind of prefascism; by the growing disenchantment with the official paradigm and values.

These are important elements which, I fancy, have to be stressed in order to get a perception of the state of affairs in the North, and which are an integral part of what has been called the mal-development of our societies. That these elements point to the need to question the Western paradigm of our

evolution (so forcefully reinforced in the past by the predominant social sciences interests), has not been sufficiently recognized in most of the papers I have read: they seem simply to try to improve within, or upon, the current paradigm.

The fundamental first step to enable assessment of research priorities for the future must address the question of paradigm change - what 'new' human values are needed (or what 'old' ones need to be reinstated) to facilitate societal change in a direction which is in conformity with social, technological, and environmental realities in both the regional and global context.

Here, one has to remember that the unprecedented rapid accumulation of wealth in the North was mainly possible thanks to the so called "Old Order" (still functioning): an international economic system whose structure was shaped through the past two to three centuries by the interest of the capitalist center economies, giving them privileged access to cheap human and natural resources, especially energy, and allowing them to use the 'periphery' (i.e., the Third World markets, the Third World countries, the former colonies) as residual markets for excess national production. This enabled them to overcome the built-in contradictory fluctuations of over- and under-capacity of production and consumption, which are inherent features of the economic organization of a capitalist society.

One has then to assume that our societal crisis is a global one, a fundamental one, and one which, in my view, cannot be reduced simply to a problem in the (past) accumulation process. It challenges indeed the very essence of the present evolutionary paradigm of the North.

If indeed there is such a developmental crisis in the North, as an integral part of a global phenomenon, this would then mean that recipes, approaches, perceptions, and strategies of the past can no longer work. 'More of the same' would simply not be enough. Most present policies of our governments, while showing signs of exhaustion and paralysis, still try to 'manage the crisis', by defending an old order and so delaying indispensable structural changes. But there is emerging a new order, which implies another set of human values. The survival of our present societies may indeed depend upon the rapid acceptance of such new values.

If my analysis is correct, new priorities in social research must focus on the critical assessment of present social patterns, including the present power structure; biases in social sciences and the redefinition of social sciences; abolishment of the ludicrous barriers among traditional disciplines; and questioning of the accepted wisdom.

The Second aspect, which is linked to the first one and which was not really addressed in those of the background papers I had a chance to read, is the 'Environmental problematique'. The crisis of Western civilization and the value system which is integrally tied to the technological revolution is linked also to what can be called the 'environmental problematique'. The problematique is not only reflected in terms of pollution or lack of integrated management of resources, but has more profound underpinnings as antithetical and antagonistic to the concept of 'Harmony between man and nature'. This has prevented, among other things, development in solidarity with future generations, fraternity with other societies and a self-sustained accumulation of wealth which does not threaten anybody (or any other society).

Rajhi Kothari, while recently addressing in his keynote paper 'Environment and Development' prepared for a regional seminar on 'alternative patterns of development and lifestyles in Asia and the Pacific, wrote: "The primary cause for large areas of underdevelopment and inequity is to be found in the global structuring of the man/resource relationship in which a minority of nations have in pursuit of parasitic and wasteful style of life shared up the large bulk of world resources: the spread of the same style of life among the elites of the countries of the Third World has also meant that they remain divided both within each of them and between them severally: this in effect means that the richest segments of both "developed" and "developing" nations continued to indulge in lifestyles that result in perpetuating global inequity, depleting world resources and unsettling nature's balance".

The official demise of the ecological imperative, and consequently of the intimate and complex relations between the ecosystems and the human societies living within them, has not only led to a serious degradation of the global resource base.¹ This phenomenon has been called the "colonization of nature" due to the ever growing needs for raw materials and energy, and has favored a type of societal organization where the human being is less and less important. Kothari, to quote him once more, has expressed this idea in the following way: "The result is that there are in this world millions and millions of what are known as 'marginal' men and women, people for whom society has no use.

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- 1) These aspects are not well known and one may refer to E. Eckholm's presentation before the U.S. Senate on the "environment and basic human needs" where these global challenges are extremely well presented; cf. also a recent study by Canada's Science Council on the Sustainability of Canada's present Food and Agriculture system.

The upshot is that man himself has become superfluous and obsolescent; he is being looked upon as a burden not just on nature but also on society. Paradoxical though it may sound, the system that modern man has produced is one in which the most dispensable element is man himself".

From the foregoing perspective, the formulation of research priorities for the 80's and beyond, would have concrete implications whose elaboration would go much beyond the intent of the present comment, but whose assessment is essential in order to define research priorities in the field of science and human values.

A third and last point in this context is that the consequences of the foregoing points stress the need for an 'alternative' development in the 'North' as almost a prerequisite for fundamental change of the present world order towards 'good' development.

If one accepts this, a wide range of implications emerge with regard to ways and means for the industrialized countries to redefine their development as well as their societal organizations. First and foremost, 'new' paradigms would have to lead to much more 'self-reliance' in the North as an indispensable step to achieve true global interdependence. Without going into detail, one could just mention the general policies at the national level which would promote the advocated structural changes: encouraging industries into more socially useful production which would ultimately lead to a new production ethic; eliminating wasteful production schemes, which should ultimately lead to a new consumption ethic by using renewable energies and resources; focusing on smaller economic cycles, which would lead to much more involvement of people in generating new activities; favoring decentralization of decision-making, of economic and human activities, promoting local self-reliance. An alternative utilization of gains in the productivities of the national economy will also require much attention: translating them into a surplus of time (the "alternative time use" as a strategic vector for social change!) rather than a surplus of goods and services may well have a profound, and lasting effect for change, favoring non-economic values, behavior and activities.

The path toward less maldevelopment in our countries requires also considerable change in lifestyles, and social relations which would be challenged by those who benefit from the present order. The identification of major obstacles for internal social change (legal, attitudinal, educational, political, informational) and the identification of means to reduce them, by giving essentially highest priority to people's involvement

and participation, by acknowledgment of the on-going changes in attitudes and values, by releasing the tremendous creativity of people, of devising visions of alternative futures for their societies - all are indispensable priorities for research and experimentation. Social science research has to become truly socially relevant.

The legitimisation of 'alternative development experiences' (ADE) and more active contribution to alliances of people and communities engaged in ADE are areas to be considered immediately. This may imply the support and funding of non-paradigmatical (so-called 'crazy') research, which may be at the forefront of new ideas. Research priorities have to be addressed to paradigm change and not to bolstering the current paradigm - its shortcomings are now well known. This would mean, audacious support of social research for the promotion of an 'objective' critique of our societies, societal values, the involvement of people in identifying their own research needs, rather than being mere objects of study and research. These are elements which I think would have immediate relevance for new priorities in research funding.

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INTRODUCTION

One of the objectives of this conference, I would hope, would be to sketch the outlines of future research programs aimed at a better understanding of the social role of science and technology. The uncharacteristic inclusion of philosophers in these discussions suggests to me a willingness on the part of the sponsors to at least tolerate discussions of broad themes and general principles which might inform those research designs. Ideally, such discussions can provide the nexus for the fine-grained research that will certainly be needed. To this end, I propose to draw on recent developments in two areas of research, technology assessment and alternative technology, as a basis for providing a better understanding of the social role of technology than presently exists, among either the general public or college-trained technologists.

The lessons to be learned from each enterprise are based on past failures in some areas, as well as successes in others. The questions which underlie my analysis, and to which such lessons are instructive, are these: What steps can be taken and what confusions need to be removed such that the general public can begin to see technology as a part of the social and political fabric rather than as an uncanny unintelligible force, which daily demands new accommodations? What can be done to create an understanding of the social role of technology which could lead, in turn, to creation of the will to control technology, by subjecting it to the higher goals of a just, democratic, and sustainable society? How can the confidence to take charge replace resignation and passivity? In terms of those persons currently engaged in implementing technological change, especially the scientists, engineers, and academically trained managers, the questions become: What misconceptions about the enterprise of technology, and its intimate connection with science, have contributed to the tendency to frame nearly every issue solely in technical terms? Why are questions of the public interest either left out or else answered by the technologists themselves, in ways that display striking cultural naiveté? For both the public and the technologists, I shall argue, the face of technology remains veiled.

There are reasons for believing that this situation is being altered. Such reasons are based, in part, on perceptions that, however unwelcome it may be, the rules of the game appear to be changing. Resource and environmental limits have started to turn up. Technology, itself, has become a topic of discussion. At the same time, a new spirit of inventiveness is yielding technical solutions to practical human problems which do not fit the mold of industrial technology. A confidence is beginning to emerge in alternative ways of meeting basic human needs for food and shelter and of providing meaningful work roles. In terms of the intellectual underpinnings of industrial technology, a challenge to scientism continues to grow. The positivistic model of the scientific method, though it still dominates the technical education, is under severe attack by some philosophers of science. Alternative theories are now viable.

I wish to suggest that these disparate signs of change contain, in admittedly inchoate form, the elements of a more accurate picture of the social face of technology. By providing an interpretation of these signs, and by suggesting the intellectual components of a new model of technology, to which

they point, it is to be hoped that that picture can be somewhat clarified.

The lessons which are drawn from the discussion of technology assessment (TA) in the following section, may appear excessively negative. It is, in fact, the case that our research at Georgia Tech¹ involving an examination of 24 large-scale TAs (budgeted at \$120,000 to \$320,000, and typically lasting over 18 months) uncovered many more kinds of failure than examples of success. Beyond explanations of failure which were related to leadership style or personality clashes among team members, there remained many unanswered questions. Why was this type of interdisciplinary research so difficult? What communication barriers prevented a successful integration of components in the TA into a coherent, synoptic document? How was it that the initial impulse of the TA movement itself, aimed at providing an "early warning system" against unanticipated, unintended, and unwanted side-effects, often turned out, even in the most successful instances, to be a mere listing of policy options? Why were efforts to involve the public in the assessment process either blatantly patronizing or clear-cut failures?

Answers to these questions, I shall suggest, involve a failure of the participants in the TA process to adequately grasp the social dimensions of technological action. For the citizens, technology remained hopelessly embedded in technological jargon and esoteric calculations. Their primary response to the process was one of intransigence and suspicion. For the experts, their tendency to see every question in technical terms reflected an inadequate understanding of the social character of science and technology and a scientistic intolerance of all other forms of inquiry. I shall argue that a rapprochement between these points of view may be possible.

The lessons to be drawn from the emerging alternative technology movement (AT), while also pointing up the need for better understanding of the social context of technology, appear somewhat less negative than is the case with TA. Much AT, it is true, is preoccupied with hardware alternatives--passive solar houses, renewable energy sources, alternative agricultural practices. Furthermore, some AT practitioners display outright hostility toward attempts to give the movement a coherent intellectual grounding. Others, however, especially those interested in forming citizen co-ops of various types, have begun to come to grips with the politics and economics implicit in their programs. A small number of AT researchers have sketched the outlines of an alternative model of science itself, one that subordinates component analysis to system understanding. Questions of systemic equilibrium assume a central importance. Some of the more reflective AT proponents are attempting to devise a set of operating principles and design criteria which go well beyond questions of economics to include such matters as long-term sustainability, environmental compatibility, intelligibility, and meaningfulness of work roles.

After having provided a critique of TA, and the philosophy of science which it assumes, and having indicated the new directions and design criteria that are suggested by AT, I will discuss possibilities for future research about technology that can result in its being more widely understood and subject to democratic control.

TECHNOLOGY ASSESSMENT

Technology assessment as a separate and distinct approach to understanding technological change is scarcely more than a decade old. As it was conceived by U.S. Congressman Emilio I. Daddario,² and introduced into subcommittee testimony, it was meant to be a new form of policy research that would systematize the identification of positive payoffs of technological innovations and facilitate their practical implementation. TA would also assist in the isolation of potentially negative payoffs, and, accordingly, provide policy advice aimed at their elimination or moderation. Hypothetically, at least, the possibility was entertained that the technological enterprise in question might have to be completely stopped. Institutionalization of the TA concept followed. By 1972, eighty six offices within U.S. federal agencies were claiming that their operations included the performance of TAs. The National Environmental Protection Act of 1969 and the Technology Assessment Act of 1972 mandated TA and environmental impact analysis for technological projects receiving federal financing. Outside the U.S.A., TA established a foothold in Japan, Canada, and Europe (primarily England, France, and the Federal Republic of Germany; Scandinavian countries and Holland to a lesser extent). For the most part, the non-U.S. view of TA was that it represented nothing really new. This was probably due to these countries already having made commitments to some form of state-coordinated industrial growth--and idea that still rankles U.S. industrialists and workers alike.

Coming as it did at the end of the turbulent decade of the 60s, TA reflected an uncharacteristic disenchantment with the technology that had been so closely identified with the very idea of progress itself. Yet, this dissatisfaction has resulted in little more than a shrug of the shoulders for the average citizen and a determination on the part of technologists to "fine-tune" the system with additional technical fixes. Neither group seemed to possess an understanding of the social and political dimensions of technological action that could form the basis of a more fundamental critique. Some significant mind-set appeared to be blocking their attempts.

During the course of my own academic career, involved with the teaching of science, engineering, and management majors, I, too, have puzzled over the difficulties involved in communicating a concept of technology that makes it more than artifacts and applied science. Research aimed at determining why the first spate of TAs sponsored by the U.S. National Science Foundation were generally unsatisfactory, reinforced this puzzlement.³ I now believe that a major impediment to a fuller understanding and better basis of control of technology lies with the concept of technological neutrality. I wish to designate this concept the "neutrality of technology myth" (NTM), because, like any myth, it has, at the same time, the capacity to both explain and to obscure, by virtue of the power of its selective focus. It satisfies our human curiosity and blinds us to its own inadequacies.

Part of the effect of NTM is due to a bit of word magic. The term 'technology' is ambiguous, in at least two ways. In the first place, it is used in both the collective and the distributive senses. Its collective use is exemplified in a phrase such as 'Western technology' as opposed to 'Western religion' or 'Western art.' Distributively, it appears in phrases such as 'computer technology', 'energy technology' or 'the technology of weather modification'. Critiques of the present industrial order, as offered by Ellul, Mumford, Schumacher, Arendt, Illich, etc., use 'technology' in its collective sense. With TA this is never the case. Assessment is always of

individual technologies, e.g., electronic funds transfer; collections of related technologies, e.g., solar energy technologies; or projects involving particular technologies, e.g., "Scenic Hudson power project." TA in its institutionalized form never evaluates technology in its collective sense. 'technologies assessment' comes closer to actual practice.

'Technology' is ambiguous in a second way. As with a number of other terms, such as 'science' or 'government', 'technology' possesses both a process and a product sense. Each of these terms in its product sense entails collections of things -- bureaucrats and politicians, codifications of knowledge found in books or papers, tools, and machines, etc.; the dynamic patterns of human activity. We relate to technology-as-product either by using tools to implement our intentions or, as is more often the case today, by simply taking such products for granted, in satisfying our needs of comfort, mobility, diversion, etc. In the extreme, when everything is functioning properly, these products simply disappear from view. Technology-as-process is more difficult for us to pin down. We see its tracks around us, yet we appear to accept its ongoing inevitability.

Perhaps paradoxically, that form of technology to which we seem closest -- technology as product -- is the one we are most loath to criticize. Identifying technology with tools and other human artifacts, we draw the apparently obvious conclusion that this technology, in and of itself, is neither good nor bad. This is NTM in its most obvious and appealing guise. Assessment of technology becomes primarily an examination of human intentions, judgments, or goals of those who commission, design, or use morally neutral tools. The hammer in my hand enables me to build a cathedral or crush a skull. The choice is a human one, and the moral evaluation is directed at human conduct. Somehow, in the process, technology itself slips through the net and disappears from critical scrutiny.

At a slightly more sophisticated level of understanding -- the level of operation of TA, I would argue -- we may be willing to grant that a particular technological device or system is generating undesirable side-effects (hazardous wastes, intolerable working conditions, etc.) and that something needs to be done. The designer was short-sighted, we conclude, or perhaps he is excused, since, after all, the design was "state of the art" for its time. The corrective involves more technology -- for every technological dysfunction there is a corresponding "tech fix."⁴

NTM thus contributes to the not-seeing of technology. It creates a divorce of the assessment process from political critique and obscures the fact that technology, instead of being mere neutral means, comprises a form of life. NTM leads, in the case of the education of the engineer, to an almost total lack of appreciation for the social and political values implicit in accepted technological practice. It thus renders the technologist undisposed toward, and incapable of, performing a moral assessment of the social role of his/her own praxis.

Such a condition need not be so. Eliade⁵ has documented the fact that medieval mining practice was intimately involved with religious ritual. There was nothing morally neutral about an enterprise that might be viewed as a theft upon nature. Lynn White, Jr.⁶ notes that early lumbering practices included the placating of tree spirits. North American Indians asked forgiveness of the animals they were forced by necessity to kill. Before we dismiss such examples out of hand, as evidence of primitive superstition, it is instructive to inquire into roots of our own mythology.

NTM, I would argue, is rooted in two powerful intellectual traditions, the first consisting of the image of science grounded in rationalism and evolving through the various stages of positivism; the second, involving the political philosophy of classical liberalism. While I would not claim that all scientists, especially those who have faced up to the disturbing implications of quantum theory or relativity, persist in this viewpoint, nor that philosophers of science remain locked into this position, I do believe the working model of science, as it is communicated in the classroom, and especially in the training of engineers, remains wedded to positivism. The connection between engineering philosophy and political system of classical liberalism is even closer. Each mind-set restricts the vision of the technologist and makes nearly impossible a moral critique of the social dimensions of his work.

Although the working model of science is rooted in the rationalism of Descartes and Leibniz, the dead-end of radical subjectivism which rationalism implied, was exposed by the empiricists, especially Hume. Yet Leibniz's sharp distinction between vérités de fait and vérités de raison remained. His claim that a unity of these truths was possible became the program of early logical positivists such as Russell, Wittgenstein, and Carnap, in the attempt to devise a universal "thing" language which combined the rigor of mathematical logic with a system of atomic facts. The prospect on the horizon was that of a unity of all types of scientific endeavor, expressible in a common artificial language. As Apel⁷ notes, the claim was now made that objective knowledge was possible, independent of the problems of intersubjective communication which plagued natural languages.

The main points of the logical positivist's position are familiar to philosophers of science. Yet they bear brief repetition because, despite their subsequent refinement, or even abandonment by philosophy of science, they continue to inform the model of science upon which engineering practice rests. In addition, for some social science disciplines, which continue to smart under a second-class status of respectability, vis a vis the natural sciences, they define the ideal that any would-be science ought to emulate.

In the first place, the model is reductionist. Complex phenomena need to be reduced to collections of distinct particulars, which can, in turn, be subsumed under sets of covering laws. By means of the universal thing language it is asserted that observational statements can copy facts, which in this form, are to be considered theory-independent. By a subsequent reconstruction, facts and laws are shown to be related in a deductive-nomological complex.

Secondly, understanding, the presumed goal of the scientific inquiry, is limited to that of explanation, which itself consists in the establishment of logical connections between statements. This limitation has proven to be extremely powerful and effective. It excludes from the process of explanation the need to appeal to teleology, that is, consideration of goals, intentions, dispositions, and motives and it facilitates prediction and intelligent manipulation of the material universe. Applied specially to the human world, it explains action according to patterns of behavior. Both the animate and inanimate spheres become the domains of pure objects.

In the early phases of logical positivism, the deliberate exclusion of human intentions from the process of explanation may be viewed as an explicit corrective to the psychologism which plagued earlier epistemological theories. The ruthlessness with which the verification principle was applied to systems of human thought is, thus, somewhat understandable. But, while this early

tenet of analytic philosophy was subsequently weakened with the dawning awareness that an artificial thing language presupposed and existence of a language community -- an insight first expressed by Willgenstein in the concept of language games -- its impact on scientific practice is still strongly felt. Experimental verification remains the touchstone of intelligibility.

The result has been an attitude of condescension or intolerance on the part of scientists and engineers towards the insights, intuitions, or speculative world-views of the non-scientific public. In the worst cases, this impatience reduces to a blatant scientism. In response to it, the general public, as well as students of the arts and humanistic disciplines, often simply accept the apparent accuracy of the "two culture theory" and direct their concerns and their energies elsewhere. The need to move beyond such a response is an absolute necessity, especially as regarding the issue of public participation in the TA process, a topic about which I shall have more to say later.

The positivist model of science largely defines TA methodology. Scientific preoccupation with explanation, and its wish to exclude as extraneous, considerations of subjective intentions, desires, and concepts of understanding that go beyond the legitimate, though limited, goal of predictability, is reflected in the manner in which a particular TA proceeds. One technology, of a related set of technologies, is envisaged as ripe for implementation, improvement, or extended application. If the scope of the investigation is broader than the question of mere market feasibility, in which case the sponsor is likely to be a private firm, it is probable that action will be instigated by local, regional, or nation-wide agency. From the ranks of academe, national laboratories, or private contract shops, an assessment team is assembled. Economists, along with physical scientists and engineers, dominate such teams, both in numbers and in extent of influence. Though it may be changing, the role of social scientists has been minimal. The TA begins by describing the present capabilities and limitations of the technology in question. This is placed in the societal context by a so-called "state of society" description, consisting of an evaluatively neutral listing of current societal values, institutions, and political arrangements. Disciplinary experts are called on to make technological forecasts by means of tools such as trend extrapolation, Delphi techniques, historical analogues. Next, the team engages in a process of informed prediction as to what will be the most likely impacts of the technology on the society. This exercise in anticipation is frequently broken down into categories: economic, political, institutional, technological, legal, environmental, with the residue lumped into one called "social impacts."⁸ Finally, toward the goal of easing the technology in question into the social context, various policy options are offered which may mitigate its adverse effects and expand its positive potential.

As initially envisaged, TA was seen as a form of policy research that aimed to "...ask the right questions and obtain correct and timely answers."⁹ But by 1974 one influential proponent of TA would complain that its promise was being inhibited by "...a penchant for searching out right answers, whereas, in assessment, the emphasis is not on right answers, but the analysis of alternative consequences."¹⁰

This shift in approach is both significant and unfortunate. Nor is it by any means an isolated event in the development of TA methodology. The concerns which gave rise to TA came from both the general public and from the scientific and technical community. But when TA sought to address these

concerns, it adopted the only model of systematic, rational discourse with which its practitioners were familiar -- the positivistic model of science. As a result, whatever critical impulse TA might have originally possessed ended up being co-opted by the enterprise which it had sought to critically oversee. Because of the impossibility of generating an exhaustive set of policy options, TA always settles for a plurality of "feasible" ones. But since questions of feasibility mask moral, social, and political values, TA remains locked into both the value neutrality of the applied scientific method and the value biases of the prevailing institutional technostucture.

The reductionist approach, which typifies scientific methodology, is also reflected in TA practice. Team members attack the problem of understanding both the technology in question and the range of probable impacts by fragmenting the problem along disciplinary lines. Unfortunately, the variations among disciplines in nomenclature, standards of proof, availability of relevant past research, and characteristic approaches and tools, make it extremely difficult to reassemble the pieces into a coherent picture. (The unsatisfactory, piecemeal character of a number of completed TAs prompted a series of "TA assessments" funded by the U.S. National Science Foundation and including our own effort at Georgia Tech.¹¹)

The emphasis in the positivist model of science on explanation, especially as it makes prediction and manipulation possible, translates in TA practice into systems models which trace the ways the technology can be expected to develop and interact with the society. Identification of policy options amounts to the location of the institutional and political levers, operation of which can ease the introduction of the new process or product.

Most basic of all, however, is TA's dependence upon institutionalized science to supply the personnel, and thus the intellectual perspective, in terms of which the social role of particular technologies are to be understood. Since, as has already been claimed, science defines a form of life, legitimates explanation and excludes other models of understanding, determines the scope of meaningful inquiry and claims independence from idle speculation and human subjectivity, TA acts out these commitments in practice. It manifests a penchant for quantitative modeling, as is especially evident in cost-benefit analysis, despite the prejudicial potential inherent in the choice of discount rates.¹² It speaks in the language of the engineer or economist and has been known to resort to the "snow job" in dealing with opposition from citizen or consumer group.¹³ By restricting its investigation to 'technology' in the distributive sense, it avoids all political critique, as it could not do, if, in Dickson's terms it were to admit that "...society's technology, when reviewed as a social institution, rather than a collection of machines and tools, is structured in a way that coincides with its dominant modes of action and interaction."¹⁴

In short, the inability of TA, as currently practiced to provide fundamental criticism of technological action is rooted in its intellectual underpinnings. The concept of science which informs it involves reductionism, disciplinary specialization, manipulation as understanding, and commitment to the belief that questions of human intentions and emotions are irrelevant to the process of explanation. Science, according to this model, is seen as being able to thrive in any socio-political context willing to tolerate relatively unencumbered exchanges of technical information. Due to the apolitical character of the scientific enterprise, such a concession is perceived as posing no threat to the existing political order. Because twentieth century technology is mainly implemented by academically trained engineers,

for whom this model of science is the received viewpoint, and because modern industrial technology is itself largely applied science modulated by economics, the apolitical objectivity of science becomes the NTM. Nor surprisingly, the practice of TA, involving, almost exclusively, scientifically and technically trained personnel, is framed in the language of science. As a result, normative dialogue about technological change undergoes in the process what Marcuse termed the "translation of values into technical tasks."¹⁵

While this discussion has highlighted what seem to me to be serious problems in the TA approach, there is a place for it in a more broadly based assessment of technology. The fine-grained analyses of some of the better TAs employ techniques that can fill important gaps in a more comprehensive, and politically self-conscious investigation. Also needed, however, are other visions of technology, ones not tied so closely to existing practice. At this point an examination of what has come to be called "alternative technology" is relevant.

ALTERNATIVE TECHNOLOGY

The recent arrival on the scene of TA should be taken as a positive attempt at better understanding and control of technological change. Its failure to reach below the surface of events, however, reflects firmly entrenched beliefs which it appears unwilling, and possibly unable, to question. Continuation of technological growth, increased labor productivity, and more efficient technical processes comprise a core of virtually self-evident values. Guarantees of economic and technological freedom are taken as the best insurance of social and political freedoms.

Could things be any different? Winner¹⁶ engages us in the following bit of retrospective speculation:

One can imagine what might have happened if, in the late eighteenth and early nineteenth centuries the democratic revolution and the Enlightenment had joined in the attempt to bring technological development under conscious social control. One can imagine the founding of truly democratic institutions in which the people could have assembled to discuss (among other things) the social and technical forms which the industrial revolution would take. In this fashion political freedom might have helped shape technological progress by influencing the design of innovations which were about to enter the world. One can imagine philosophical and political debates over such questions as: what are the implications of different designs of factory systems for our freedom? What does it mean to say that a device or system is efficient or that it serves human needs? What is the best size for a particular socio-technical enterprise? Of course those discussions never took place.

In terms of the long-range perspective of the present conference it makes sense to ask: should not future research priorities include efforts to reengage these issues? Is it possible to channel technological change without stifling the dynamism inherent in conventional industrial practice? Is it inevitable that our lives in the future will be lived at the mercy of global economic forces? Is the fulfillment afforded by human work to be provided solely in terms of the industrial model?¹⁷

In attempting to answer these questions our future discussions must not ignore a number of disparate events, loosely grouped under the heading of "alternative technology." Based more on intuition than coherent political theories, on small group initiatives rather than societal mobilization, too often displaying a fascination with hardware without bothering about its social implications, alternative technology, nevertheless, presents a sharp contrast to the habits of consumer passivity and political apathy, that are presently the norm. Instances of AT range all the way from alternative energy devices, agricultural tools, transportation vehicles, building designs, in which the emphasis is primarily on hardware, to social technologies, including a number of types of co-ops, marketing, medicine, food, credit unions, telephone, fishing, memorial, and as institutional barriers begin to fall, insurance and banking. The re-emergence of neighborhood identity is occurring, often tapping the latent artisan skills possessed by various members through so-called "sweat equity" arrangements. It has also provided positive outlets for other movements which have been formed around issues such as global ecology, feminism, consumerism, civil rights. It has provided an outlet for the 60's counter-culture, as well.

A number of organizations have been formed around the AT theme, some of which, in addition to engaging in systematic research, have attempted to buttress their actions with coherent statements of the underlying operational principles.¹⁸ A variety of newsletters, magazines, and journals have also sprung up.¹⁹

Several themes appear to be common to the many forms of AT. A primary issue is the question of scale. It is generally asserted by proponents of AT that the economics of scale, which provide the rationale for current industrial practice, turn out to be incompatible with the ideal of democratic control. The corporation, with its rigid hierarchical pattern of organization, is profoundly unfree, and unresponsive toward the concerns of the society, which is, nevertheless, asked to provide its infrastructure and buy its products. Convinced that, at the present time, centralized industries, utilities, agri-businesses, and governments hold a virtual monopoly on political power, AT places great stress on decentralization of all forms of production and decision-making.

In proposing that government, industry, agriculture, and towns be decentralized to a "human scale," the alternative technologist confronts, in Winner's terms, "...a world of material accomplishments and social adaptations of astounding completeness."²⁰ Faced with this fact, AT bases an almost perverse hope on the fact that, in any case whatsoever, current practices will be forced to change. We are beset not only with material and energy limitations, but also with natural environmental limits of the earth's regenerative cycle itself. Thus, the necessity of change could provide an opportunity for radical reorganization.

Perception of environmental limits is reflected in AT's emphasis on new (or sometimes rediscovered) technologies which are ecologically gentle, careful, materially frugal and sustainable over the long term. This leads to an

emphasis on recyclability, durability, and repairability as important design criteria. For an apparatus to be repairable it must be intelligible, that is, capable of being understood with a moderate amount of training. Here, perhaps intuitively, proponents grasp the fact that passivity toward technology often stems from mystification at its operation. Thwarting our efforts to understand are industrial design practices which yield products that are either unrepairable or accessible only by highly specialized knowledge and tools.

One central element of a philosophy of human nature, of which AT is badly in need, must involve an alternative view of work. Here the somewhat oracular pronouncements of a guiding spirit of AT, the late economist E. F. Schumacher,²¹ are helpful. Schumacher's concept of the three-fold function of work, a viewpoint he formed while in Burma, places ethical constraints on the creation of an employment workplace. Every job should provide (1) a means of attaining a becoming existence; (2) the opportunity to enhance human skill capacities, and; (3) the chance to overcome ego-centeredness through joint participation in a common task. By these criteria, creation of an unrelievedly boring workplace is clearly immoral. Both Schumacher and Illich²² distinguish between moral and immoral apparatuses, basing their differentiation on whether the pace of production is or is not under human control.

Whereas the conventional wisdom accompanying modern industrial practice holds out leisure time, filled with material consumption, as the reward for stultifying and unfulfilling labor, AT emphasizes that ethical work is, to a substantial degree, its own reward. This is, however, impossible as long as worker is set against employer, the latter regarding the ideal case to be production without employees, and the former wishing for pay without employment. AT advocates democratic control of the work process, an idea that has a major bearing on the question of the ideal size of the enterprise. So far, however, there has been little inclination on the part of the proponents to espouse alternatives to private ownership.

One of the most sensitive and reflective organizations engaged in AT is the New Alchemy Institute of Woods Hole, Massachusetts and Prince Edward Island. It was started by a handful of well-trained scientists who were concerned that the practice of science, while good at analysis and fine-grained specialization, discouraged investigation of whole biological systems. In developing a self-contained food cycle, with fish (*Tilapia*) as the final product, they were forced to begin their experimentation virtually from scratch. Their efforts, documented in print as they progressed²³ attracted the Canadian government's interest. They have, accordingly, been able to integrate a number of their lines of research in an "ark" for Prince Edward Island.²⁴ Here fish farming, solar research, food growing are ongoing, housed in a largely passively solar heated and cooled building.

The writings of the New Alchemists, reflecting their preoccupation with biological systems, offer excellent support for another theme of the AT movement: the emphasis on diversity of technological approaches. In terms of transportation, agriculture, and production, the practices of the major industrial nations represent vast mono-cultures. In evolutionary terms diversity means survivability while uniformity of practices courts disaster. AT, therefore, advocates a return to regional diversity, especially in energy patterns and food production, and a reemphasis on regional self-sufficiency. The hard problem of devising a regional balance, a problem currently avoided by a massive investment in interstate movement of goods, needs to be addressed in political, not technical, terms. Perhaps paradoxically, the existence of

the vast telecommunications network offers the potential for involving all the citizenry of any region in this political task. It is, after all, now much easier to move around information than matter.

The utopian fervor and political naiveté reflected in some of its proposals make AT something to be dismissed by the more "hardheaded" industrial and governmental economists and policymakers. The viewpoint of the majority of educators in technical schools tend to reflect this judgment. Recently, however, I have detected a slight weakening of this position, and among engineering, architectural, and to a lesser extent, management students there is developing a genuinely serious fascination with alternatives. One major focus of attention is the area of energy policy. The connection between energy choices and political vulnerability is no longer questioned. The possibility of catastrophic failure of complex, interconnected energy grids is no longer merely hypothetical, nor is the prospect of inter- or intranational armed conflict over the availability of energy supplies. As a result, discussions of energy policy, once the preoccupation of the energy producers and governmental regulators, have become the topics of public debate. Writers such as Lovins and Commoner²⁵ have captured the public fancy, although, probably because of impeccable "establishment" credentials, the recent Energy Future: Report of the Energy Project at the Harvard Business School²⁶ by Stobaugh and Yergin et al., may prove to be the leading bestseller of them all.

Each of these proposals re-echoes AT themes: an emphasis on renewable energy sources, conservation, measured decentralization of energy supplies, and energy diversity. Lovins, in particular, explicitly links energy policies with the questions about human values and sketches a future scenario of human lifestyle as it would appear if a nation were to embark upon a "soft energy" path.²⁷ Commoner proposes a government-sponsored program in photo-voltaic research, patterned after the approach which led to the inexpensive semiconductor, which could make locally-produced electricity available to even the most remote and impoverished areas.²⁸

The merging of the areas of energy and AT underscores the need to frame analyses of the social character of technology in philosophical terms. Illich has for sometime argued that questions of energy and of equity were connected. Radical economist Georgescu-Roegen²⁹ has attempted to base economic discussions on the ontological foundation from which modern thermodynamic theory is derived. Other alternatives have been proposed by Daly, Odum, and Mishan.³⁰ While each of these approaches is valuable in exposing the value biases which are implicit in orthodox economic theory--value biases largely obscured by the practice of framing every economic issue in technical terms and of seeking to resolve policy questions by mathematical simulation--none offers, as an alternative to classical liberalism and utilitarian value theory, a different philosophical interpretation of the meaning of man in the world. It is just such an interpretation that is necessary if TA is to escape its scientific entrapment and if AT is to become a viable and persuasive alternative to current approaches.

PROGRAMS OF FUTURE RESEARCH

The process of acquisition of an alternative viewpoint to NTM, one which reflects an understanding of the social and political values implicit in

apparently technical choices, should proceed along two lines. In the case of the practitioners of TA, their understanding must not only transcend the vague and impressionistic picture of science garnered along with their technical training, but must also be informed by an appreciation of the substantial body of twentieth century criticism that challenges even well-articulated objectivist models. For the advocates of AT, on the other hand, their preoccupation with hardware needs to be supplemented with a broadened awareness of past utopian proposals and other reflections on technology which more adequately take into account the social and political realities of technological change. These two forms of education will need to merge in renewed attempts at TA in which citizen participation plays an important role, and in approaches to policy analysis that recognize the imperatives to engage in the political actions that are implicit in their findings and recommendations.

As I have already stated, practitioners of TA, who have characteristically been drawn from the ranks of physical scientists and economists, possess, by virtue of their training, a lack of sympathy toward philosophy of science. Their view of science tends to be a "trickle down" version of logical positivism. The objective detachment of the positivist model appears to offer adequate rationale for their own judgments about the neutrality of technology. Social scientists, on the other hand, and who, it was mentioned, are poorly represented on TA teams, are aware of the philosophical challenges of Popper, Hanson, Kuhn, Polanyi, Feyerabend, Toulmin, etc. Yet many applied social scientists seem torn between the desire to discover a "paradigm" that uniquely characterizes their own discipline, on the one hand, and the attempt to empirically ground their efforts along lines compatible with the reductive unity of all science, on the other.

Because they lack a clear picture of the conceptual roots of their own enterprise, the scientists and technologists comprising interdisciplinary TA teams encounter numerous frustrations in trying to work together. One of the most promising attempts to deal with problems such as these at a deep theoretical level has been undertaken at the Institute for the Theory of Science at the University of Gothenburg.

From the perspective of a major participant, Gerard Radnitzky³¹ the program is described as a metascientific study of research. Radnitzky affords the Anglo-American student a broadened perspective from which to view the enterprise of science. Volume I examines with sympathetic detachment the naturalist approach of Logical Empiricism. Volume II, however, introduces us to the largely unfamiliar Hermeneutic-Dialectic tradition associated with Continental philosophy. Because the Hermeneutic-Dialectic tradition has always argued that the human sciences are unique, and hence irreducible to the natural sciences, its claims may be relevant to the position I have already stated, namely, that TA and policy analysis are inappropriately constituted, when only the methods of the natural sciences are employed. The issue is posed in the form of a question by Karl-Otto Apel, whose influence Radnitzky acknowledges.

In my opinion, the chief question still is: whether it does or does not make a difference for the philosophy of science that in the human sciences, the object of science is also the subject of science, namely, human society as a communication community.³²

In terms of their practices, the traditions of logical empiricism and hermeneutic-dialectics have been contrasted the following way:

The naturalist tradition sees understanding reduced to the achievement of explanation--as subserving manipulation of the world which, insofar as man is reduced to an object in the world, includes him. The humanist tradition sees explanation as subserving understanding--which precedes, pervades, and persists beyond it--and manipulation as exercised by man, over the world and the unappropriated areas of his situation and within himself, in terms, precisely, of his understanding of himself and his world as he encounters it.³³

While space does not permit detailed discussion of the fundamental ways the hermeneutic-dialectic tradition can and must be utilized to augment the present views of science, a few observations may prove helpful. Radnitzky claims logical empiricism and hermeneutics-dialectics can provide the basis for a synthesis which will amount to a philosophical anthropology--philosophy of science will become an integral part of philosophy of culture. Apel shows how "understanding and interpretation as means of communication fulfill a complementary function to description and explanation," and argues that "...hermeneutic preliminaries to meaning-conventions are conditions of the possibility and validity of scientific objectivity and, for that reason, cannot themselves be objective in the same sense that the results of science have to be."³⁴

Both Radnitzky and Apel push toward a necessary reintegration of the sciences and the humanities and thus take us a step toward broadening the scope of contemporary technological practice beyond its scientific confines. The practical ramifications of this move are summarized by Apel.

If the relation between the objectifying science and the practice of life is a technological one, then the relation between the humanities and the practice of life must also, in my opinion, provide a complementary orientation with regard to technology. This may be performed by the humanities in a twofold manner: first, in a narrower sense, by way of hermeneutics, simply ensuring the understanding of meaning - intentions among people, and not the least between scientists and technicians, and between these experts and society as a whole....second, in a broader sense by suggesting world-views and ways of life, that is, ultimate values and possible aims of practice which could provide criteria for discussions and conventions about the requirements of a good life, including the very application of science and technology.³⁵

In the careful ways that Apel and Radnitzky examine and criticize both the Anglo-American and the Continental philosophical traditions, and in the syntheses which they attempt, there exists abundant material for new and comprehensive models of science. How these insights can become a part of

the knowledge-base possessed by technical experts remains unclear. Our research into TA team problems suggests that the person who has become deeply knowledgeable in some technical specialization is highly reluctant to expose his ignorance of matters which cut across his own subject, yet go beyond it. As a result, communication between TA team members is frequently both guarded and plagued with misunderstanding. As hackneyed as it may seem, the solution to the problem of narrow technocratic mind-sets may ultimately rest with the technical education. One encouraging sign is the current proliferation of "technology and society" type courses to which engineering and science students are being exposed. Another is the interest in AT itself, which is mainly focused on energy projects, especially those involving new vehicle and building designs.

Aggressive research programs, along the lines laid out by Apel or Radnitzky, can provide the theoretical basis for a post-industrial model of science. The possibility of a rapprochement between the Anglo-American and Continental traditions can have the very practical effect of reversing the bi-polar disintegration of the society into manipulators and manipulated. More, however, is needed. The intuitive perceptions of proponents of AT, that technology, much more than being mere tools, is a form of life, needs critical articulation. Although a strand of philosophical anarchism runs through the various pronouncements of contemporary AT, there is a reluctance to systematically draw out its implications. The basis for such a contemporary discussion already exists in the nineteenth and early twentieth century reactions to industrialism, as reflected in the utopian writings and social experiments of Fourier, Owen, Bakunin, Proudhon, Kropotkin, Goldman, and others. Yet utopian thinking was denigrated by the Marxists, who unreservedly embraced capitalist production technology (Lenin was a strong advocate of Taylorism) along with centralized and hierarchical management patterns, and who, in the end, along with their capitalist counterparts, effectively stifled all forms of utopian thinking. The result has been that, in both first and second world countries, the common sense picture of technology is a blinkered one, dominated by NTM.

The emergence of AT at the present time, coming as it has in reaction to an industrial order straining to resist the changes and accommodations it will of necessity be forced to make, affords us the opportunity to engage in those political and philosophical debates of which our predecessors in the present era were deprived. The issues to be addressed will include questions such as: When is the social organization of a production process unethical, in and of itself? What are the ethical criteria of acceptable machine designs? What values are to be realized in the establishment of a workplace? What scale of operation is appropriate in human terms, and how should it be organized? The word magic surrounding terms such as 'efficiency', 'economic', and 'productivity' will need to be exposed, and the political and social values which are hidden under a facade of quantification will need to become the topic of public debate. The mystification of technological practice can be countered by experiments in public education, such as the recent series "Connections,"³⁶ shown on public television; by continued public pressure for participation in the TA process; by aggressive consumerism; and best of all by the continued development of alternative technologies that are intelligible in their very design.

Finally, I believe we must unashamedly re-engage in utopian philosophical thinking, aimed at redefining the human-natural world relationship in spiritual,

as opposed to utilitarian, terms. It should have become apparent to us by this time that there is something profoundly immoral about a philosophy of practical action that allows us to drive the snail darter and other living things into extinction, and provides us with no basis of obligation toward distant posterity. In broadest terms, our future research should aim at blueprints for an alternative future, along with the implementation strategies that will be required. I have tried to indicate ways in which a reintegration of analytic philosophy of science with the hermeneutic-dialectic tradition, and a systematic elaboration of the ideas at work in AT can contribute to such a program.

NOTES

1. Rossini, F. et al. (1978) "Frameworks and Factors Affecting Integration within Technology Assessments." Report prepared for National Science Foundation, Grant No. ERS 76-04474. Atlanta: Department of Social Sciences, Georgia Institute of Technology.
2. Dadderio, E. (1967) "Technology Assessment Statement of the Chairman, Subcommittee on Science, Research, and Development." 90th Congress, 1st Session.
3. Op. Cit. (note 1.)
4. McDermott, J. (1969) "Technology: The Opiate of the Intellectuals." New York Review of Books (July 13), pp. 25-35. An outspoken defense of the claim that the 19th century doctrine of laissez faire has been replaced by the 20th century belief in laissez innover--Technology, if left free from excessive regulation will prove to be self-correcting of its past mistakes and failures.
5. Eliade, M. (1971) The Forge and the Crucible. New York: Harper Torchbooks.
6. White, Jr., L. "The Historical Roots of Our Ecologic Crisis." Science 155, 3767 (10 March), 1205. This distinguished historian of medieval technology has himself addressed the difficulties in doing TA, by describing the unforeseeable events which actually transpired in connection with the trebuchet, gunpowder, eyeglasses, brandy, and the long-bow. "Technology Assessment from the Stance of a Medieval Historian." American Historical Review 79, 1 (February 1974), 1-13.
7. Apel, K.-O. (1972) "The A Priori of Communication and the Foundation of the Humanities." Man and World 5, 1 (February), 4.
8. Porter, A. et al. (1980) A Guidebook to Technology Assessment and Impact Analysis. New York: Elsevier North Holland; cf. Also Arnstein, S. and Christakis, A. (1975) Perspectives on Technology Assessment. Jerusalem: Science and Technology Publishers; Hetman, F. (1973) Society and the Assessment of Technology. Paris: OECD.
9. Op. Cit. p. 12. (note 2).
10. Bates, J. (1974) "Coates' Corner," Technology Assessment 2 (February), p. 160.
11. Op. Cit. (note 1).
12. Henderson, H. (1978) Creating Alternative Futures. New York: Berkeley publishing Co. Chapter 3.

13. Cf. Arnstein, S. (1975) "A Working Model for Public Participation." Public Administration Review 35 (January/February), 70-73; additional discussions of the issue of public participation in TA cf. Carroll, J. (1971) "Participatory Technology." Science 171 (19 February), 647-653; Carpenter, S. and Rossini, F. (1979) "Value Dimensions of Technology Assessment," Proceedings Polish-American Workshop on Technology and the Future of Society. Warsaw (September).
14. Dickson, D. (1974) The Politics of Alternative Technology. New York: Universe Books, p. 180.
15. Marcuse, H. (1965) One-Dimensional Man. Boston: Beacon Press, p. 232.
16. Winner, L. (1977) "The Political Philosophy of Alternative Technology: Historical Roots and Present Prospects." Lovekin, D. and Verene, D. (eds.), Essays in Humanity and Technology. Dixon, IL: Sauk Valley College, p. 120.
17. Among the industrialized countries of the West, Canadians have shown an uncommon willingness to address issues such as these cf. (1977) Canada as a Conserver Society: Science Council of Canada Report No. 27. Ottawa: Minister of Supply and Services Canada; Valaskakis, K. et al. (1979) The Conserver Society. New York: Harper & Row.
18. A representative listing of this rapidly expanding movement would include: New Alchemy Institute, Woods Hole, Massachusetts and Prince Edward Island, Canada; Farallones Institute, Point Reyes Sta., California; RAIN, Portland, Oregon; Brace Institute, Montreal; Institute for Local Self-Reliance, Washington, DC; Intermediate Technology Development Group (founded by E. F. Schumacher), London; Domestic Tech, Denver; De Kleine Aarde, Netherlands; Lindisfarne Association, Long Island; U.S. National Center for Appropriate Technology, Butte, Montana. It must be admitted, however, that the list of casualties is probably as long as that of the survivors.
19. Cf. Mother Earth News, Foxfire Books, Journal of the New Alchemists, Co-Evolution Quarterly, Rain, Science for the People, Workforce, Shelter, Self-Reliance, Alternative Sources of Energy, The Ecologist, Undercurrents, Resurgence, Appropriate Technology, Alternatives, and an even greater number of newsletters.
20. Op. Cit. (note 16).
21. Schumacher, E. (1973) Small is Beautiful: Economics as if People Mattered New York: Harper Torchbooks.
22. Cf. especially Illich, I. (1973) Tools for Conviviality. New York: Harper & Row; (1974) Energy and Equity. New York: Perennial Library (Harper & Row).
23. Journal of the New Alchemists, Nancy Todd, editor. Woods Hole, MA 02543. (published annually).

24. For a first-hand account of the opening of The Ark cf. Baldwin, J. (1976/1977) "The New Alchemist's Are Neither Magicians Nor Geniuses. They Are Hard Workers." Co-Evolution Quarterly (Winter), pp. 104-111. Canadian Prime Minister Pierre Elliot Trudeau officiated at the opening.
25. A. Lovins has become a cult figure with a calculator. Best known of his writings are: (1976) "Energy Strategy: The Road Not Taken." Foreign Affairs 55, 1 (October), 65-96; this article, revised and expanded into book form (1977) Soft Energy Paths: Toward a Durable Peace. Cambridge, MA: Ballinger Publishing Co.; cf. also (1975) World Energy Strategies: Facts, Issues, and Options. Cambridge, MA: Ballinger Publishing Co.; (1975) with J. Price, Non-Nuclear Futures: The Case for an Ethical Energy Strategy. Cambridge, MA: Ballinger Publishing Company. Barry Commoner's current thinking regarding energy and society is presented in "The Solar Transition" The New Yorker 55 (April 23), pp. 53-98, and (April 30), pp. 46-93, and in The Politics of Energy. New York: Knopf, 1979.
26. (1979) New York: Random House.
27. Lovins, A. (1977), (note 25), pp. 161-170.
28. In a Navajo village at Sweetwater, Arizona, photovoltaic cells are currently providing electricity to drive water pumps. Fifty homes now have water that previously had to be trucked in in 55-gal. drums. Refrigeration as well as for the first time, become possible.
29. (1971) The Entropy Law and the Economic Process. Cambridge, MA: Harvard University Press.
30. Daly, H. (1972) Toward a Steady-State Economy. San Francisco: Freeman; Odum, H. and E. (1976) Energy Basis for Man and Nature. New York: McGraw-Hill; Mishan, E. (1973) Technology and Growth: The Price We Pay. New York: Praeger.
31. (1973) Contemporary Schools of Metascience. Chicago: Henry Regnery Co.
32. P. 3. (note 7).
33. O'Malley, J. "The Eternal Triangle of Theory, Praxis and Process." The Human Context 1, No's. 2 and 3 (July) 312.
34. Pp. 28, 28 (note 7).
35. Ibid., pp. 29-30.
36. Co-produced by the BBC and Time-Life Television and presented on U.S. P.B.S. by WQED, Pittsburgh.

TECHNOLOGY ASSESSMENT - THE PROCESS

- A CANADIAN PERSPECTIVE -

A.R. Demirdache

I. INTRODUCTION

Technology is developed to serve a purpose, to be useful. Usefulness implies assessment or evaluation. It should not come as a surprise, then, to find that technologies have always been assessed. This assessment process has itself been carefully examined. Concepts such as efficiency, return on investment, and the production function are all concerned with the measurement and evaluation of technological production processes. Half of economics is technology assessment.

Private enterprise has been the main source of technological development. Because private firms are concerned with selling products to individual clients, technology assessment has "naturally" focused on benefits which accrue to the users of the technology. Efficient markets and the dominant importance of the private returns of a technology are sufficient to assure us that, in most cases, the best assessment of the technology will come from those who are actively engaged in promoting the state of the art.

Some technologies have such a widespread impact that its social returns become more important than private returns. This, or market inefficiency, may mean that the "natural" assessment process is inadequate. Economic selection criteria alone are not enough when, for example:

- parties other than producers and consumers are affected by a technology (pollution);
- market breakdowns are important (bankruptcy of a firm which stocks toxic substances); or,
- optimal individual behaviour results in suboptimal system behaviour (automobiles as mass transit).

These examples of social returns associated with private enterprise suggest a need for a better way to make decisions about technology. When the social implications of a privately-developed technology become considerable, the government may have to regulate the industry in order to manage the social returns. A government must always assess the social benefits of publicly-managed technology. In either case, Technology Assessment (T.A.) is an appropriate tool to be used.

In recent years, Technology Assessment has emerged as a new discipline in the policy sciences. The role of Technology Assessment is to expand the range of issues to be considered to include those impacts not normally looked at by private enterprise. Interest in Technology Assessment has increased enormously as can be seen from the growth in

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literature, conferences and associations devoted to it. This interest is partly due to the greater complexity and interdependency of modern society. Short range, ad hoc responses to the problems of growth and change are seen to be inappropriate in many instances. The growing conviction that there must be better ways of making decisions has led to the exploration of a wide variety of planning aids. Many experiments in planning have failed. Faith in Technology Assessment is based on the hope that the additional perspective provided by placing a greater emphasis on social returns will lead to a more rational development of technology. It is not based on a history of successes for Technology Assessment or its supporters. One thing is certain: as the demand for Technology Assessment grows, the search for consistently sound methods of assessment must continue.

Technology Assessment attempts to evaluate all of the impacts (economic, social, environmental, cultural, etc.) of a technology on all affected parties (producers, consumers, and society generally). Technology Assessment, as practiced in governments, may overlook the private returns of a technology. These are the economic impacts between the producer and user of the technology. It is argued that since the private returns are always considered by those promoting the technology it is only necessary to consider the secondary "spinoff" impacts. The form and content of a Technology Assessment depends on who is doing it and for what purposes. For those against and for those in favour of a development, Technology Assessment is an advocacy procedure. Those who have to settle disputes between proponents see it as an adversary procedure.

II. SOURCES OF TECHNOLOGY ASSESSMENT

There are three sources of Technology Assessment: interest groups, industries, and governments. For the interest groups, Technology Assessment serves as a rationalization for their spontaneous support of or opposition to some technology. Technology Assessment in this case becomes very much entwined with the political activity it supports. Separating the politics from the assessment is often difficult but is necessary in order to arbitrate justly between adversaries. Interest group assessments generally concentrate on social impacts (e.g., opposition to nuclear technology) but there are exceptions (e.g., support of solar technology).

Industry assessments concentrate on primary impacts. Secondary impacts may at times be considered out of a sense of good "corporate citizenship", however, it has been pointed out that company directors can be held legally liable for pursuing policies which do not support profit maximization.

Because Technology Assessment is often an advocacy procedure, governments can play multiple roles in it. A government may concentrate on primary impacts in those cases in which it is attempting to promote an industrial development. Departments such as Industry, Trade and Commerce

and the Ministry of Transport may find themselves in this role. ¹⁹¹Secondary impact Technology Assessments are important in those departments charged with protecting the environment or private citizens (e.g., Department of the Environment and Corporate & Consumers Affairs). Governments may have to arbitrate between opponents and supporters of a technology. This requires a weighing of the evidence.

III. DISCIPLINES AND TECHNIQUES USED IN TECHNOLOGY ASSESSMENT

Engineers, economists, and physical scientists make up the bulk of the staff of institutions which perform and sponsor technology assessments. Six types of assessments are identified: (2, 14)*

- | | |
|------------------------------------|--|
| Normative Assessment | - <u>Criteria:</u> Assessment of impact of future societies on technology. <u>E.g.</u> , "The Selective Conserver Society", GAMMA, Montreal, 1977. (7) |
| Wide-scope Assessment | - <u>Criteria:</u> Open-ended consideration of possible impacts in several categories; multidisciplinary teams; the intention to support and influence public decision-making; a level of funding sufficient for in-depth examination. <u>E.g.</u> , "Northern Frontier, Northern Homeland", The MacKenzie Valley Pipeline Inquiry, Ottawa, 1977. (1) |
| Partial Assessment | - <u>Criteria:</u> Consideration of pre-selected secondary consequences in one or more categories. <u>E.g.</u> , "Study Project for a Canadian Programme on Controlled Thermonuclear Fusion", Ottawa, 1975. (6) |
| Problem-oriented Assessment | - <u>Criteria:</u> Focus on a societal problem to which technology is a contributor or a possible solution. <u>E.g.</u> , "Branding Out", report of the Canadian Computer Communications Task Force, Ottawa, 1973. (21) |
| Environmental Impact Statements | - <u>Criteria:</u> Focus on environmental impacts of technology. <u>E.g.</u> , "The Port Granby Project: Environmental Impact", Eldorado Nuclear Ltd., Ottawa, 1977. |

*Figures in brackets refer to the references at the end of the paper.

Futures
Studies

- Criteria: Trends affecting future utilization and development ^{pg 2} technology - supply/demand studies, technological forecasts, long-range planning studies.
E.g., "Interfutures", OECD, 1979 (13) and "The Future of the World Economy", (20) U.N., 1978.

Technology Assessment "methodologies" advanced by a number of analysts are basically similar; they can be reduced to a structured analytical process involving several simple steps or tasks: (14, 16)

- Definition of the subject of inquiry; description of the subject technology and its parameters; development of data base.
- Description of alternative, supporting, and competitive technologies.
- Development of state-of-society assumptions, for present and future time periods.
- Identification of potential impacts.
- Analysis of and evaluation of impacts in terms of
 - a) affected parties, systems, and processes; and
 - b) probability of occurrence, direction, magnitude, and duration of induced change.
- Identification of possible action options.
- Assessment and comparison of alternative action options.

Technology Assessment is most adequately performed by interdisciplinary teams using a variety of analytical techniques to accomplish the above tasks, augmented by on-site investigations of specific projects, and with the option of commissioning additional research, if needed.

IV. INSTITUTIONAL MECHANISMS IN THE PUBLIC SECTOR

Objective assessments are not easily obtained. It is often difficult, for example, to avoid bias or conflict of interest, particularly since those who know most about a technology are often employed in the advancement of it. To be effective, a Technology Assessment must meet three conditions: a) incoming evidence must be complete and unbiased; b) the process by which decisions are made must be credible; and, c) the possibility for implementation of recommendations must exist. There is a variety of ways in which a Technology Assessment can be organized. Each organizational structure meets the three conditions in different ways and at different costs.

An assessment conducted entirely WITHIN A DEPARTMENT will: ¹⁹³

- a) eliminate bias due to outside pressure by keeping the study confidential and the experts anonymous. If, however, the department does not have a sufficiently multidisciplinary staff, bias may be introduced due to restriction of the information base or a lack of countervailing opinion. There is a strong conflict-of-interest potential if a department is responsible for promoting or regulating the technology under study;
- b) enhance the credibility of the study within the department but will tend to decrease external credibility; and,
- c) greatly improve the effective and efficient implementation of guidelines if the department has the power and the mandate to manage the technology being considered. If the department has no authority, the Technology Assessment may be next to useless.

An assessment conducted by an INTERDEPARTMENTAL COMMITTEE or task force will:

- a) increase the amount and variety of expertise available for the study, thereby reducing bias. However, it is possible that the pursuit of different departmental missions will amplify the bias of the stronger representatives;
- b) increase credibility of high visibility and perhaps high levels of influence of individual members. Credibility may be decreased if the committee does not allocate appropriate research funds for detailed studies; and,
- c) increase the time necessary to implement recommendations, since these will likely involve several departments. Once underway, implementation may benefit by having several promoters.

Other organizational structures for Technology Assessment could include the use of consultants, a Royal Commission, an opinion survey, or a study prepared by a university or research institute. Clearly, judgment is needed to match organizational arrangements with the purpose of the Technology Assessment. Nevertheless, many Technology Assessments have failed either because the study was not placed in the proper organizational context (e.g., one department trying to force decisions which need the concurrence of others) or because a group with limited resources failed to restrict the scope and purpose of the study.

SURVEY OF TECHNOLOGY ASSESSMENT IN CANADA

Many activities on the international scene have influenced the increased interest in Technology Assessment. The following can be mentioned:

- a) The international discussion and cooperation in the environmental field, pursued in connection with the United Nations Conference on the Human Environment.
- b) The science and technology programs of the OECD* have been modified considerably as a consequence of the ministerial meetings in 1971 and 1975, and now stress a more rational and socially acceptable approach to the application of technology.
- c) A growing international consensus on the pervasiveness of energy and environment constraints has created the need for the development of Technology Assessment procedures. The first international conference on Technology Assessment methodology was held in 1978, at the International Institute for Applied Systems Analysis (IIASA).

While governments are seriously concerned with the need for Technology Assessment, institutions for its accomplishment exist only in a few cases.

The institutionalization of Technology Assessment has not proceeded in Canada in the same manner that it has in the U.S. where an Office of Technology Assessment (15) reporting to the Congress has been established. In Canada, decisions concerning large technological projects are taken by Ministers in Cabinet, not by Parliament. There are good arguments in favour of having a Technology Assessment capability serving the Official Opposition. (9) Such a capability would be especially useful in checking the Government's technological activities as well as in prodding the Government to action when such encouragement is needed. Technology Assessment, while being a useful aid to this adversary process, is also a tool of management. Because it is more appropriate to avoid error than stop it when it happens, it is more important to have an effective Technology Assessment capability within the executive branch than it is to have an independent office of Technology Assessment. (9)

Within the Canadian Federal Government, each department conducts its own Technology Assessments in accordance with its particular needs and responsibilities. This approach to Technology Assessment is for the most part adequate but fails under certain conditions:

- a) If no department has a mandate to oversee a particular technology or its impacts, then a Technology Assessment is unlikely to take place.
- b) If a number of departments have different or overlapping interests in a technological development, they may each assess it independently and produce conflicting recommendations or implementation guidelines

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- c) A department, in strict pursuit of its mandate, may promote a technology which, when assessed under wider terms, is detrimental to the public good. In such a case, inherent conflict of interest precludes effective assessment.
 - d) The technology under consideration may be so pervasive that no government, federal, provincial, or municipal, has authority to act.

The last case clearly presents a problem since leadership has to come from somewhere. There is a role in "big picture" assessment problems for quasi-independent, quasi-governmental bodies such as the Institute for Research on Public Policy, the Science Council, the Economic Council, and the Design Council. The purpose of the Science Council is to arouse public concern and raise public understanding in matters involving science and technology, and at the same time, to transmit to government its carefully considered opinions on what should be done.

In order to examine all the short and long-term consequences of technologies, the Science Council has recognized two aspects of technology assessment, (11) namely the assessment per se and the processes operating within the social system which conducts the assessment. The Council refers to this latter aspect as a "Technology Assessment System". (9)

The Science Council functions sometimes as advocate, sometimes as assessor. It plays the roles simultaneously; however, it places emphasis on assessment. (17) The advice of the Council is helpful to the Government in reviewing the issues and possible solutions, but the Council itself is not in a position to make definite decisions. One of the most interesting developments in the last decade has been the conceptualization and the propagation throughout the public and private sectors, of the concept of futures studies. The future is not only an integral part of the thinking of many federal agencies, e.g., Transport Canada, Energy, Mines and Resources, the Science Council, the Economic Council, but it is also flourishing in many senate committees, e.g., the Senate Special Committee on Science Policy. In the private sector, Bell Canada is probably the most active of all Canadian companies in futures research. Another company with a considerable range of futures activities and a substantial outside reputation in this field, is the Royal Bank of Canada.

Some of the most significant studies in Technology Assessment and long-range planning are being carried out not by government or industry, but by organizations exclusively devoted to policy analysis. They are, in many instances, non-profit institutions with public and private clients. The objective of the Institute for Research on Public Policy "is to improve the quality of informed decision-making in matters of public policy". It operates on the income from a large endowment and on government contracts. The Hudson Institute of Canada, founded in 1974, is supported by client membership and by fees for research projects. It has recently published a study called "Canada Has A Future".

GAMMA (acronym from Groupe Associé Montréal/McGill pour l'étude de l'avenir) is best known for its study of the "Conserver Society". (7)

The group has also published a study for the provincial government on the future of Quebec, with emphasis on six sectors: economies, ecology, technology, the geographical distribution of economic activity, values, and Quebec's relation with the rest of Canada.

GAMMA and the Faculty of Environmental Studies at York University, Toronto, are the Canadian representatives in an international study of development, GPID (Goals, Processes, Indicators, Development). It is a project of the U.N. University in Tokyo and is being directed by the peace researcher, Johan Galtung, in Geneva.

The Institute for Policy Analysis at the University of Toronto carries out economic policy analysis, with the use of the Trace Model (Toronto Annual Canadian Econometric Model). Other institutions operating in this same area are the Conference Board, Informetrica, Data Resource of Canada, and the C.D. Howe Research Institute. Prominent among the institutions offering specialized services is the Canadian Energy Research Institute, located at the University of Calgary, Alberta. It is sponsored by the Federal Department of Energy, Mines and Resources, the Alberta Department of Energy and Natural Resources, the Private Energy Research Association, and the University of Calgary. Founded in 1975, it conducts economic research and Technology Assessment studies in the energy field. Trans-Canada Social Policy Research Center of Montreal produces the "Canadian Trend Report" for its clients in the private and public sector. The center, which was established in 1977, works on the same principle of measuring the amount of newspaper space given to various topics as the "Trend Report" produced in the U.S. by the Institute for Policy Process.

Various social groups other than the actual initiators and proponents of a technology are claiming the right to have their way in decisions concerning the future application and diffusion of a technology. (9) The explosive interest in public participation in Technology Assessment is another long-term development in public policy. (1) Instances of public opposition to new technologies appear to have been more frequent during the period of accelerated worldwide innovation over the last 30 years. The more widely known instances in this period include the fluoridation of water supplies (mainly in U.S.A. and Canada), Concorde (again in U.S.A. and Canada), and the opposition to new airports (Pickering and Mirabel). Since the worldwide wave of environmental concern in the later 1960's, there have also been numerous instances of successful opposition which have led to a ban or tighter regulation on innovations with undesirable side-effects, e.g., DDT and other pesticides, aerosol sprays, and car exhausts.

If the current wave of opposition to nuclear power is merely like the environmental concern, (2) which swept a number of industrialized countries a few years ago, one might expect it to die away in a similar fashion as planning and regulatory procedures are tightened, as public support is captured by new concerns, and as people become accustomed to living with nuclear power stations. This, of course, assumes that no serious nuclear accident occurs anywhere in the world. Alternatively, if the root cause lies in public fears about the peculiar dangers of

radioactivity and an association in the public mind between civil nuclear power and the terrors of nuclear weapons, public opposition may intensify and increasingly curb the growth of nuclear power. (13) 197

VI. RATIONALITY AND POLICY-MAKING

The goal of Technology Assessment is to help the policy-maker to find the best decisions in complex managerial situations. It is, to paraphrase Herbert A. Simon, (18) the continuation of classical numerical analysis by other means. The "other means" are such tools as linear programming, simulation, search theory, and systems dynamics. Technology Assessment, as a normative theory, tells the manager how he ought to proceed. Of course, as more and more managers follow its advice, it also becomes a positive science, describing some of the actual decision procedures employed by organizations. The ideal rational public policy-maker obtains the best technical advice on the different alternative policies and their implications, then chooses among them according to his preferences. It is now accepted that this approach to public rationality is impracticable. In reality, politicians and policy analysts have to decide how to limit the gathering and evaluation of information.

Recently, J.I. Gershuny (8) has proposed a reformulation of the concept of rationality in public policy-making. Following Lindbloom's rejection of "comprehensive rationality", he formulates a coherent concept of "limited rationality". Such a strategy has already been proposed by Etzioni (3) as a "mixed scanning model" and by Dror as the optimal rational model. (3) The proposed strategy can be summarized as follows: (8)

"Policy-makers should consider the implications of alternative procedures for the imposition of closure of consideration of policy alternatives, on the basis of an initial comprehensive but general consideration of alternatives. They should choose rules of closure so as to include, for detailed consideration, i) policy options which appear desirable to policy-makers, and ii) options which would benefit groups with values differing from the policy-makers', wherever the policy-makers are indifferent. They should carry out detailed analyses within the rules of closure, and finally choose policy on the ground of (i) and (ii) above."

The usual argument is that a naive rational model is inadequate because of the difficulties of anticipating or considering all alternatives or all information. As a result, March and Olsen emphasize ideas of "adaptive rationality". (12) This is experimental "learning by doing" of individuals or groups. Most adaptive models have the property that if the world and preferences are stable and the experience prolonged enough, behaviour will approach the behaviour that would be chosen rationally on the basis of perfect knowledge. Many questions in Technology Assessment, as in economics, cannot be answered simply by determining what would be the substantively rational action, but requires

an understanding of the procedures used to reach rational action. Herbert Simon has developed a number of approaches to procedural rationality. (18) Procedural rationality takes on importance for economics in those situations where the "real world" cannot be equated with the world perceived and calculated by the economic agent. It specifies both the algorithms for finding optimal or good decisions and procedures, usually empirical and pragmatic, for evaluating such decisions. Conceptually, these theories are concerned with trade-off between the quality of the solution and the cost of funding it. Technology Assessment, and new academic disciplines like Sociotechnics, (4) however anticipate, forecast and evaluate the impacts of its technological change on all sectors of society in answer to real public concern. Technology Assessment is feasible. What it requires is a political mechanism that will allow such studies to be made and set up criteria for the regulation of new technologies.

VII. PRIORITIES FOR FUTURE WORK IN TECHNOLOGY ASSESSMENT

The four major technological developments which may be expected to have a remarkable influence on the organization and development of advanced industrial societies are the following:

a) The development of new forms of energy:

A vast technical effort is in progress to enable Canadians to reduce their dependence on oil. Huge technological ventures are under way mainly in the field of heavy oils, biomass, solar energy and nuclear energy.

b) Electronics, including the revolution in microprocessors:

In the long term, the electronic revolution will change the face of advanced industrial societies. Production, transmission and processing of the most varied information will be at the heart of the economic activity and social life, and the cost of hardware will often be negligible compared with the time required for designing software, for collecting and up-dating data and for users to adopt the new systems. It is expected that issues like respect for private information, proliferation of data banks and absence of monopoly in the electronic industry will continue to be hotly debated.

c) The exploration of energy and mining resources in the oceans:

The ocean contains considerable resources of hydrocarbons and of metals which are generally in the form of polymetallic nodules. The exploration of oceans' energy and mining resources may be launched on a commercial basis around 1985. It should be noted that this exploration will depend less on technology than on policy decisions concerning the Law of the Sea, a field in which the clashes of interests are in proportion to the gigantic economic potential of ocean resources.

The spectacular development of fundamental knowledge in biology in the last 20 years will have as much impact on industry as physics and chemistry did in the last 50 years. There are increasing signs of production processes in which the activity of living micro-organisms might partly or wholly replace physico-chemical processes. The development will be in the areas of bio-fuels, protein feeds, ecological pesticides and biological catalysts. The emergence of the bio-industry will naturally amplify the problems of controlling the risks which it presents to the ecosphere (uncontrolled development of bacterial strains and spread of genetic mutations, etc.).

VIII. CONCLUSIONS

There is a wide diversity of managerial practices and it would be unwise to single out any given procedure as a model for future Technology Assessment studies. (5) The evaluation of the studies mentioned in Sections III and V show that most of these can be labelled "technical-economic feasibility studies". In several studies, past trends are outlined in broad terms, but mainly those which are supposed to be proven beneficial to the development of a given technology. Only one study, the "Berger Inquiry", (1) gives an exhaustive inventory of possible trends relating to the future application of the energy technology and makes an attempt to provide a qualitative evaluation of the most and less promising developments. Very few complete assessments have been carried out up to now. The main reason seems to be the loose definition of the subject or an unrealistic delineation of the study in comparison with the constraints of timing, money, and available skills. The experience available (5) suggests that full assessment of technology can be carried out only when the analysis is limited to reasonably carefully defined technological application, so that the analysts are able to consider, in sufficient depth, all the impacts. For these reasons, Technology Assessment has little chance to evolve and to transform the present approach to decision-making. No evidence exists to show that Technology Assessment studies reduce the amount of uncertainty or simplify decision-making. The main advantage may be a more systematic structuring of uncertainty and above all a greater awareness on the part of the decision-makers of often-neglected or unnoticed impact areas. Of these problems Herbert Simon writes:

"...a statistician once found a very high correlation between the number of old maids and the size of the clover crop . . . he was able to trace what appeared to him to be the causal chain. Old maids, it appeared, kept cats; and cats ate mice. Field mice, however, were the natural enemies of bumble-bees, and these latter were, in turn, the chief agents in fertilizing the flowers of the clover plants. The implication, of course, is that the British Parliament should never legislate on the subject of marriage bonuses without first evaluating the effect upon the clover crop . . ." (19)

The real implication is, of course, that many impacts are trivial and should be excluded from the analysis. In reality, decision-makers observe the effects of their decisions and "adjust the scope of concern and establish new *satisficing* goals according to their assessment of their own decisions". (18) Thus, decision-makers, in "dealing with complex situations, do not optimize or maximize, they *satisfice*, that is, they search for solutions until they find one that is good enough". (10) It is very difficult to conduct a truly meaningful evaluation of a technology to optimize its impacts and to assess its global "social relevance". (5) This clearly constitutes a serious challenge to advocates of Technology Assessment.

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Stanley R. Carpenter, Background Paper: Technology
Assessment and Appropriate Technology

The author's incisive analysis of the neutral technology myth inherent in current approaches to technology assessment clearly exposes a much-needed redirection of the field's methodological base. His creative solution - to explore alternatives such as appropriate technology - represents a potentially effective means of balancing the "neutrality bias" by focusing on value-laden assessments of technology. In this regard, a useful linkage could also be made to the Conserver Society visions of technology which, on the surface at least, have considerable potential to go beyond the concept of appropriate technology in meeting future societal needs in an era of resource scarcity.

At the same time, research priorities addressing the methodological requirements of technology assessment should not be overlooked. As the author notes these include: broadening the representation of professionals in the TA field, which will require not only new interdisciplinary approaches but, perhaps more importantly, new bases for training TA professionals; incorporating citizen participation in the TA process; and developing a more effective interaction between TA and policy decision-making.

A. R. Demirdache's paper is largely a descriptive review and as such does not present much in the way of challenging new ideas for comment. However, the paper is replete with statements and assumptions that reveal a particular bias on the part of the author (Stanley Carpenter might call it "the neutrality of technology myth" or NTM), and are each of them worthy of full debate. I cannot list, let alone discuss, all of them, but for purposes of illustration in the Introduction we find the following arguable premise:

"Efficient markets and the dominant importance of the private returns of a technology are sufficient to assure us that in most cases, the best assessment of the technology will come from those who are actively engaged in promoting the state of the art."

Part of the problem of course is semantic - it is not clear in context for example, what the author means by such terms as "efficient", "sufficient", etc., or for that matter by "technology assessment" itself. My main point, however (and this is a sub-theme of the Carpenter article), is that the proponents of a particular technology may well be the last people who should assess and evaluate it on society's behalf.

The author presents a classification of approaches to assessment which while useful, is simplistic in that the categories are broadly overlapping. Certainly some types of assessment would fit into three of four categories.

He then presents almost without comment a commonly understood idealized structure for the process of technology (and impact) assessment which is deserving of comment, since in any given case the different elements presented will be differentially emphasized. In almost no case does the process really work as this simple description suggests. For example, 1.) "Definition of the subject of inquiry" --- as the author pointed out earlier, the scope of the assessment will depend entirely on for whom and for what purpose the assessment is being done. Often there is no attempt even to determine the "public interest" in the case at hand.

2.) "Description of alternative ... technologies" --- Ideally, "consideration of alternatives" should include analysis of:

- i) alternate sites or designs for the proposed project;
- ii) alternate means of achieving the same objectives (i.e. alternate projects or technologies); and
- iii) alternate beneficial uses of the resource base to be affected by the proposed development (i.e. the "no-go" option).

Usually, however, the institutional arrangements for impact assessment (EIA) or technology assessment (TA) involve self-assessment by the initiating agency. There is obviously no incentive for the proponent of a particular technology or project to undertake a thorough self-defeating analysis of the types suggested in II and III. Hence, equal or even credible analysis of these alternatives (the truly interesting ones) are rarely a part of EIA.

3.) "Identification of potential impact" --- this assumes that it is in fact possible to do so! If we have learned anything from the application of certain technologies on a global scale, or even those with a local "systems" impact, it is that the most important impacts or effects may be unpredictable or unknowable before the fact. I am not referring here to known potential impacts that are hard to estimate but to entirely new phenomena deriving from the interactions of known and unknown components of the social or environmental system impacted. Examples might include:

- i) most of the sub-lethal behavioural impacts and effects of pesticides (i.e. biocides) on non-target organisms leading to local extinction of many bird and fish populations;
- ii) the immense increase in infant ill health and mortality resulting from the introduction of formula-feeding to 3rd world countries. In this case, technology is adopted largely for social reasons (the prestige accruing to practitioners of western-style bottle feeding) but the necessary sanitary controls and clean water are missing. Infants are placed in double jeopardy by the partial technology since it both introduces the pathogens to them and denies them access to the immune systems normally transferred in mother's milk; and
- iii) the unanticipated and unprecedented formation of a massive hydrogen bubble at the Three Mile Island nuclear facility that nearly precipitated a major radiation disaster. Such occurrences as these render estimates of risk on, or related to, known phenomena almost meaningless.

I am not arguing here for not taking risks. This is an argument for:

- 1.) admitting that we don't know much about the behaviour of the systems -- social and natural -- we are concerned about.
- 2.) acknowledging that, in any event, such behaviour is situation-dependent and unpredictable (i.e. unknowable).

This is therefore also an argument for research into small-scale and diverse, rather than global and uniform interventions in human environments if only in the hope of minimizing the scale of disaster! That is, let us experiment boldly with acceptable risks and inconsequential failure. This reasoning is also implicit in much of the argument presented in the Carpenter paper.

The author provides a useful description of two modes of TA in the public sector -- in-house or self-assessment and interdepartmental (relatively independent) assessment. He then notes the relatively primitive state of TA in Canada. One can only agree with his implied suggestion that M.P.'s (he mentions only "the Official Opposition") should have research capability in this area (combined of course with "freedom of information"). It is curious to me however that this section of the paper omits any mention of the Federal Environmental Impact Assessment and Review Process (EARP), or the Federal Environmental Assessment and Review Office (FEARO) set up to manage it. This must surely be one of the most visible and controversial forms of TA extant in Canada.

EARP in Canada has no legal basis and is founded squarely on the principle of self-assessment. While significant strides in improving the process have been made particularly in the last year, it suffers from all the weaknesses set out by the author for assessments "within a department". Rather than comment further here, I refer to a copy of a discussion paper I've recently prepared on the subject¹.

The author sets out a number of "Priority" areas for further work in the area of TA. These are all areas of hard science likely to have immense impacts on society. Here and in the conclusions is the fundamental perspective of this paper most clearly revealed. TA is seen almost exclusively as a relatively limited technical exercise. Its purpose is basically to identify the likely impacts of new developments and to determine their technical and economic feasibility. However, even in this context the author admits "no evidence exists ... that TA studies reduce the amount of uncertainty or simplify decision-making." Yet no challenge to the status quo is suggested in this paper. The author seems to accept the current mode of technological development and implementation as inevitable. The best we can hope to do through TA is to improve our current "satisficing" in decision-making and learn to duck when things go awry.

In conclusion then, this paper is a highly technocratic look at TA. What suggestions there are for future research directions relate to specific technological sectors whose impacts require investigation. No consideration is given to understanding the structural factors (social, economic, political, etc.) and values that are fundamentally responsible for spawning and proliferating technology and then are structurally affected in turn. Society is implicitly portrayed more as the lackey than the master of a gathering technological force. In my view the areas of future TA research emphasis suggested here are the least likely to produce useful results.

S. R. Carpenter, on the other hand, presents a much more structural analysis of the nature of technology and TA, and offers an explanation for the failures of the latter. Carpenter argues that the dominant mind-set toward technology in western society is rooted in an outmoded scientific positivism that assumes technology per se to be value free. The practitioners of TA are generally cast from the same mold as the originators of technology and hence approach the evaluation of technology from the identical mind-set and perspective. Unable to appreciate the implicit socio-political values inherent in a generally accepted technological pattern, TA-ers are inherently incapable of evaluating the "rights" and "wrongs" associated with that technology.

Originally intended to aid decision-makers in making correct decisions TA has therefore degenerated to the uncritical descriptive analysis of alternative consequences. Every effort is made to find policies to mitigate adverse effects while enhancing the positive aspects of the innovation in question. The criteria brought to bear in these circumstances are inevitably themselves technical with some acknowledgement to other quantifiabiles such as economic feasibility.

I have a great deal of sympathy with Carpenter's perspective. In the circumstances described it is easy to understand how we have come to be dominated by technology rather than the reverse. In the absence of sociopolitical evaluations at important levels of decision-making, society seems committed to and propelled by the technically feasible, more than the socially desirable. We are swept along by our own creations - technology makes possible the fully integrated multi-national corporation, agri-business, massive "development" projects, centralized utility and communication networks and other forms of cultural monoculture. Economies of scale provide the unchallenged rationale. In short, because these things can exist, they do.

Another interesting point noted by Carpenter that feeds the process described above is the ambiguity of the word technology -- it has both a collective and selective or individual connotation. The focus of TA and particularly impact assessment is almost exclusively on individual developments or technologies. We never evaluate "technology" in the collective sense at all. As a result individual developments are assessed in a vacuum, without reference to the broader goals of society or even related policy areas. The absence of any sort of global perspective (even on a regional scale) inevitably means decisions a stroke-at-a-time. In the words of Canadian ecologist I. McT. Cowan, "we are destroying the biosphere by insignificant increments!".

Carpenter's analysis appeals to me also because it is compatible with a long-held belief of mine. I don't think there is any such thing as an environmental crisis or any energy crunch, or a population problem or -- etc.. These are all symptoms of a much more fundamental malaise. Each "problem", ironically enough, is capable of technical solution. Why then do these problems persist? I believe the answer lies in our failure to understand the basic behaviour of human sociopolitical institutions which has remained essentially unchanged for millenia. This behaviour, so fundamentally linked to individual behaviour, may indeed be virtually unchangeable depending on the extent to which there is a fundamental (genetic?) basis for human social behaviour. Social and political behaviour based on the primate pattern of self-esteem and hierarchy, bluster, ritual and posturing leads inevitably to political paralysis in complicated multi-group forums. Thus the power of "big technology" as a cumulative, dynamic, exponential, cultural phenomenon far outstrips the capability of our relatively primitive and static mechanisms for social control of that phenomenon on any "global" scale. Any solution to technical problems and TA that ignores this "behavioural" problem is in my view doomed to failure.

Carpenter makes the interesting connection between TA and alternate technology (AT) as two responses to the technologically-based "crises" of our time. AT is an explicit rejection of big science, big technology, big government, based, in Carpenter's view, on a different set of moral and ethical values and perceptions. It is therefore fundamentally different from TA which accepts the dominant societal value-set.

I again concur with much of what Carpenter has to say in this regard mainly because his analysis again reveals the importance of human institutional and systems behaviour in all this. Carpenter notes the "intuitive perceptions of --- AT that technology much more than being mere tools, is a form of life ...".

In terms of my earlier arguments AT is an essentially structural response. It is certainly not a rejection of technology per se. AT recognizes implicitly that large-scale technological systems acquire systems behaviour and properties of their own; counterintuitive, unpredictable and dehumanizing. It also accepts the inability of large-scale social institutions to do anything about it. The response is to seek local, small scale, and diverse (even redundant) alternate ways of achieving human satisfaction through technology. On this "appropriate" scale, the technological beast is controllable and in the service of man, the consequences of its failure relatively limited, and the sociopolitical institutions more capable of adequate control and response to failure.

In summary, I think Carpenter's paper touches on some crucial points fundamental to understanding and controlling technology. Carpenter's arguments are based on his perceptions of the role of differing and sometimes sub-conscious value-sets in influencing approaches to TA. The paper implicitly and explicitly makes the connection between values and sociopolitical behaviour, and the structure and behaviour of technology systems.

Much of TA today accepts the technologically possible without serious question and merely tries to predict the outcome(s). Society at all levels is of course massively changed by technological innovation. To date however these pervasive impacts occur with the bulk of ordinary citizens in the role of passive observers, (and increasing actually getting in the way of progress!). Will we ever learn to ask whether the technologically possible is desirable from the individual and social point of view? Carpenter's paper suggests it should be possible for people to assume the active role demanded by human dignity. We can:

- 1.) change the structure and scale of social institutions to suit human purposes -- behavioural, psychological and social;
- 2.) adapt technology to serve human purposes at this level.

Simple as it seems this is a substantial reversal of the dominant cause/effect relationship between the structure of social institutions and technology today.

In my view this critical research area is more likely to yield important results relating to TA than are efforts to improve our abilities in passive prediction (where the record is dismal in any case).

¹Rees, W. E. 1979. Reflections on the Environmental Impact and Assessment Process: A Discussion Paper. (Canadian Arctic Resources Committee, Ottawa).

Professor Guédon's paper brings a most important dimension to the Conference. His warning, that by engaging in it, on the terms apparently envisaged, we risk the defeat of our own intent and the betrayal of those very values we are at pains to defend, should be taken most seriously. Nor is it necessary to share the ideological position from which the warning was issued to appreciate its importance and force. For very different reasons of my own which I shall try to make clear, I agree fully with the warning. And in this I join also with Mrs. Stewart who, speaking for us all, has voiced the same warning most eloquently.

The issue which is thus forcefully brought to our attention, under a variety of auspices, concerns the nature and relationship of theory to practice. An ancient issue which takes on a new urgency in these days of massive and often irreversible technology. In common with others (Bindon, Carpenter) I reject the "internalist-externalist" dichotomy, because neither arm of the proposed dilemma seems to me to be rationally tenable. So I find any proposal for a summary take-over of theoria by praxis unacceptable. It is all very well to be reminded of the dangers and temptations of "ultimate" theories, whether of human nature or of science, - or, should we not add, of history? But that is a far cry from having no theory at all. When an inadequate hypothesis such as that of "economic man" remains as a myth to be exploited by vested interest, this is because of an intellectual failure in the first place. A failure to recognize the limitations of the hypothesis, to admit the mis-understanding it generates, to devise a more adequate methodology for testing it, and to discard it for a more adequate one.

If we treat the history of scientific activity, or indeed of any form of intellectual activity as though it were little more than the reflection of the rise and fall of vested social interests we lend ourselves to the creation of yet another vested interest and add yet another myth to those enshrined by "the experts" to their own greater glory and power.

It is good to be reminded that science is an activity but not at the expense of a perverse confusion of science, techniques, and technology. Science is an intellectual activity. It has perforce to be carried out under a variety of institutional auspices both public and private, but the only vested interest it can serve is that of the truth. At one time our universities provided as their prime concern the context within which this disinterested activity could flourish. Now, however, they have increasingly become training centres for the development and production of technical and professional "experts".

Knowledge, of which science is one form, is successful knowing, an activity not a product. It is a uniquely personal activity, and can have no vicarious existence. Knowledge cannot be "appropriated". It must be communicated and learned - with difficulty. Techniques on the other hand, though parasitic upon some knowledge, however rudimentary, for their inception are essentially in the public domain. They are directed, not to the truth, but to doing something, producing some object or state of affairs. Their concern is with power. Neither the trainee nor the adept need to understand what they are doing so long as they can follow the instructions. Technology, the systematic organization and deployment of techniques, often, however, becomes a systematic attempt to substitute technique for knowledge. Then it becomes the breeding ground for "experts" - adepts and managers, and our universities have become forcing houses for their production.

For these reasons, techniques and even technologies can be "appropriated". They can be, and are, bought and sold, stolen and given away. For these reasons also Prof. Guédon's proposals are two-edged. They are useful, even necessary, for breaking the monopoly of power, for exorcising the "magic" of the sorcerer's apprentices. But they will not thereby make people more knowledgeable or better. Extending the franchise to other power groups, or even to all and sundry, may only spread the disease. This is the crux of the problem of how to extend beneficial technology to the Third World and of the problem of how to make sound education available throughout our own society. It is an issue which is conveniently brought into focus within the context of "appropriate technology". (Cf. Bindon, Jackson, Knelman: and especially, Carpenter).

I found Professor Carpenter's paper especially valuable. It confirms the points made in Professor Hooker's brief diagnosis of the conceptual shortcomings which have brought us to our present state. The all-pervasive positivistic model of science: the reductivist methodology which goes along with it and appears to confirm its adequacy, because no counter evidence is allowed in principle to appear: the consequent attempt to reduce even language to an assembly of machine-readable codes: and the emphasis on explanation to the detriment of understanding and heuristic discovery: these have all contributed to obscuring the true nature of scientific activity in favour of a myth, the myth of scientism.

Carpenter's references to the two-faced character of technology, specific and collective, as process and as product; and the way this systematic ambiguity lends itself to the further myth of value-neutrality in technology and its consequent cloak of invisibility are also most important.

I am somewhat puzzled by his suggestion that there is a close link between the political philosophy of classical liberalism and the neutrality of technology myth. The myth pervades all sorts

of political systems (Cf. Knelman). If he means, however, that there is a very close affinity between utilitarianism as a philosophy of values and moral obligation and the myth, then of course he is quite right. This becomes a most important factor when the ones who are invited to join in technology assessment as the representatives of the fundamental values of human communities turn out to be, almost exclusively, either economists, or those who believe that a calculus of utility or social preference is the only rational ground for all human values.

I am also puzzled by Carpenter's favourable comments on social scientists in contrast to physical scientists in technology assessment. My own experience has been the reverse. But that is beside the point. It leads, however, to what I consider a serious issue. Most references to science in the papers seem to have had a classical model in mind. At least I have seen no explicit reference to statistical methods and explanation as special matters for discussion. This, given the vast development in power, in sophistication, and in areas of application of statistical investigation, has surprised me. I believe that there are very unusual and important difficulties involved in the operation of statistical methods which deserve investigation. Of course there is a growing body of reflective writing at a general level concerning the relationship and differences between statistical and classical methods, and I agree that social scientists tend to be aware of it, though often at a superficial level. But I am after a different issue: the actual practice of statistical method, and the way in which good or bad habits of performance are generated. In a way it might be called a psychological problem; because the world of the statistician is so very different from that of common sense. So in the first place there is a great temptation to seek ways of "objectifying" the data and process of investigation. Since "common sense" is what is supposed to be transcended by the methodological character of the investigation it is not surprising that the social scientist should be greatly tempted to turn to the ready-made "objective" myth handed down from 19th C. positivism. Added to this is the fact that, while the verification processes of classical and statistical methodology are very different, they are both required and are complementary to one another if "hard" conclusions are to be achieved. Braithwaite (Scientific Investigation) long ago pointed out that while classical method could (at least in principle) be accommodated to Hume's notion of causality, the early and necessary intervention of judgement on the part of the investigator into the conduct and verification of statistical investigation, is incompatible with Humean explanation. So there is a fundamentally paradoxical situation always latent in scientific investigation of a statistical nature. This is so quite independently of the very different issue of whether "persons" constitute an appropriate or even possible field of study for statistical science. This is true even in "hard" areas of the biological sciences, where not only objectivity" but also "reductivism" have to be faced and transcended, not just in principle but in fact. Especially e.g. in neurophysiology.

I need hardly add that the systematic difficulties and ambiguities of this situation have been vastly compounded by the tremendous but blind power which the development and use of computers has put in the hands of the statistical investigator. As a result of this the paradoxical situation has been systematically compounded. By its very nature, use of the computer requires that we reduce choice to decision, judgement to machine-readable instruction, and reasoning to calculation (another element in the myth, going back to Hobbes). We may declare that inductive investigation is not in principle reducible to deductive process: we may even be theoretically convinced that this is the case, but our practice belies our protestations. We know, for instance that the "logic" of sampling cannot be formalized and used, as we would in the case of deductive schemata. But we continue to act as though it could. The computer will not permit us to do otherwise. Professor Sutherland's paper, which greatly impressed me, provides many examples of great sensitiveness to this situation, and Prof. Guédon warns us of it in his own way and has his own solution. Prof. Michalos on the other hand gives us, in my view, an egregious example of blindness to the paradoxes latent in his programme and invites us (at great public expense?) to engage in a massive exercise in sophistry. Professor Braybrooke on the other hand, with customary acuity and lucidity points us in the right direction and provides us with a brief, well thought out, programme of research. I have no doubt whatever that such a programme would be carried through with great integrity, clarity and precision if it were done by him or under his direction. But I do have a reservation.

I have mentioned paradox. This is a defect of methodology. It is more than a systematic ambiguity, it is a malignancy which renders investigation sterile by making verification impossible, requiring contradictory conclusions to be drawn with equal methodological force from the investigation. Sophistry on the other hand is a defect of the investigator or of his purported argument. It need not be conscious or deliberate, it seldom is. But it occurs whenever we lend ourselves, however, unconsciously, to a paradoxical methodology. Sophistry is endemic in the practice of statistical investigation, and growing rapidly because of its necessary reliance on the computer. We have here an analogue to Carpenter's myth of technological neutrality. But it is not a myth, it is a fatal disease of our own methodology.

"There are areas where our values are all that we have" (Sutherland). Indeed there are. But if they are garnered by opinion pollsters they are no longer ours but those of the pollster. If they are represented as the reflection of the vested interest of an ideology they are no longer ours but those of the ideology. If they are interpreted in terms of a utilitarianism, however subtle, they are no longer ours, but those of utilitarianism.

So I return to Professor Braybrooke. With characteristic honesty and brevity he has declared his philosophical position. It is one which provides ample room for manoeuvre, but it has its limits, very definite ones. These are precisely the ones which come into contention when we

address the issue I referred to earlier as to whether "persons" constitute an appropriate field of study for statistical science. Clearly not. But we are left then with the even more taxing question of the adequacy of philosophical method. How open or closed must it be if we are to avoid unconscious sophistry.

The only way to come up with an answer to that is, of course, to get on with the business of philosophical analysis and criticism, including criticism of our own activities as philosophers. In this connection I would agree with Carpenter on the importance of bringing the resources, the traditions and the critical power of other systems of philosophy than those of logical empiricism into the context, the investigations and the practice of the problem area we have set ourselves to examine. But I have no illusions about how difficult it is to make the attempt. Nor do I believe that philosophers need to engage in utopian thinking in order to fulfil this task. Plato undoubtedly arrived at many wrong conclusions and succeeded in doing so with such power and subtlety that we still may be led astray by them. But he also made it possible for countless generations of men and women to put to themselves the simple question "Was Socrates right?" and to find the answer in themselves.

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Commentary by Robert D. Jewell, Department of Philosophy,
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Given the tenor of the following remarks about the paper, mention of one aspect of my "credentials" is in order, namely that I was among the first group in my generation to question the adequacy of the foundations upon which logical positivism had built their analysis of science. Thus the following criticisms would not appropriately be attributed to the fact that they come from a believer in an outmoded tradition.

Most importantly, for it apparently undermines the whole project of the paper, the author nowhere shows (or cites where it is shown) that the "neutrality" of the practice and/or theory of science is either logically incompatible with or conceptually at odds with political or moral decisions concerning what to do with the fruits (products and processes) of technology and science. At best he brings forth some evidence for a claim--interesting in its own right--that there may be something in the psychology of individual scientists or the sociology of the scientific and technological community which prevents them from making such decisions when they are grouped together under the headings of "technology assessment" and "appropriate technology". Unfortunately, this does not seem to be what he is arguing for, neither is it that for which the therapy proposed in the paper would be appropriate. Indeed, until a profound question can be answered in the negative, that question being: "Is the 'objectivity' or 'neutrality' of the theory and practice of science and technology one of the essential ingredients in what they are and what they have achieved," the therapy proposed in the paper by references to Eliade and Lynn White, jr. on page 8 and the quotation from Winner on page 15, can only be described by one word, "frightening!"

My second point would be, simply, that the author nowhere tells us what the "neutrality of technology myth (NTM)" is and thus we do not know what it is that we are to target our therapy upon. (I suppose my first point now could be stated alternatively as, the author nowhere shows that it is a "myth"--sometimes myths express protocols of the highest importance.)

Perhaps the most useful part of the paper as fodder for the seminar would be the series of questions asked in the penultimate paragraph on page 15. Fortunately, these questions are independent of the thesis presented in the paper.

P.S. Frankly, the solution to the only problem successfully raised by the paper seems embarrassingly obvious: viz., reintroduce a liberal arts education as a necessary part of an engineer's "training".

PAST WORK AND FUTURE PRIORITIES
FOR SOCIAL INDICATORS OF
SATISFACTION AND HAPPINESS

by

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Social indicators are statistical measures that are supposed to have some significance for the quality of life. The fact is, of course, that nobody ever needed social science or social indicators to learn that different people often have different feelings about similar aspects of their lives. That, after all, is what makes a horse race. Nevertheless, it is precisely this commonplace phenomenon that has stimulated much of the current research on so-called subjective or perceptual social indicators. We want to know why different people often have different feelings about the same things. If one asks oneself why this question seems so pressing, I think the answer must be because much more often, most of the time, most people feel practically the same way about most things. For very good physical, biological and social reasons most people are more similar than dissimilar to each other. If it were not so, then within any society the habits of communication, entertainment, transportation, eating, working, and so on would be unmanageable. Without plenty of uniformity, we would have plenty of chaos. We expect and in more or less subtle ways we cultivate and construct uniformity. Consequently, non-uniform, unexpected, unplanned phenomena confront us as anomalies. Moreover, perceived anomalies are necessary conditions of scientific research. When nothing is regarded as strange and unaccounted for, nothing is regarded as in need of explanation. The perceived need for an explanation of something is the threshold of scientific investigation, and probably magic, religion and philosophy for that matter. (This is basically Kuhn's (1962, 1977) view.)

The social indicators movement has generated its own anomalies. For example, although Cantril (1965, p. 194) reported a rank order correlation of .67 between his socioeconomic index and people's ratings of their present life on the Self-Anchoring Striving Scale, he also found that "the rank order correlation between the index and personal economic concerns was 0.01, with national economic concerns, -0.05; and with national social concerns, -0.01 - all indicating a complete lack of any relationship." (Cantril, 1965, p. 201) Campbell (1972) reported that nearly half of the relatively poor white American respondents in a "large-scale urban survey" described themselves as "very satisfied" with their housing. Schneider (1975) reported significant differences between American cities when appraised using objective versus subjective indicators. Duncan (1975a) noticed that although there was an increase in the standard of living of respondents in Detroit from 1955 to 1971, there was no increase in the reported satisfaction with the standard of living. Allardt (1976) found that material level of living and reported satisfaction were independent. Hankiss, Manchin and Füstös (1978) reported similar levels of perceived quality of life for people living in countries with dissimilar scores on a developmental index. Michalos (1980b) reported that although Americans were over five times as vulnerable to violent crimes as Canadians, national surveys in 1973 and 1974 revealed that roughly 40 percent of respondents in both countries expressed some fear of walking alone at night in their own areas. It was anomalies such as these that prompted Campbell, Converse and Rodgers (1976, p. 115) to speak of the "dilemma" of social indicators research, namely, that "We become most suspicious of bias or measurement inadequacy when subjective assessments come into conflict with objective situations, although such discrepancies taken substantively are almost the principal reason for the conduct of the study [of subjective indicators]."

Most of the research on subjective social indicators has centred around problems involved in the measurement of satisfaction or happiness with particular domains (e.g., housing, family relations and health) and

with life as a whole. Measures of life as a whole are referred to as **217** global measures, in contrast to more limited domain measures. In the next two sections I will briefly review some of the most salient literature in this field from the twentieth century. For a thorough and extremely thought-provoking historical review of the literature on satisfaction and happiness beginning in about the seventh century B.C., one should read Tatarkiewicz (1976). The next section is on the theories, models or hypotheses that have been proposed in order to explain perceived anomalies, e.g., hypotheses about the role of expectations, aspirations and so on in the determination of feelings of satisfaction. In the section following this review I present some ideas on plausible next steps to take in order to increase our understanding at key points in the current stage of the discussion.

2. Overview of Previous Research

One of the first things that occurs to researchers interested in explaining anomalies in this field is that expectations have a lot to do with the way people feel about their objective circumstances. The hypothesis that reported satisfaction is a function of the perceived difference between achievement and expectations has been tested in a variety of experimental situations with mixed results. Confirming evidence has been reported by Spector (1956), Foa (1957), Hulin and Smith (1965), Ilgen (1969, 1971), Locke, Cartledge and Knerr (1970), Ilgen and Hamstra (1972), Greenstein (1972), Lewis (1973), Space (1974), Gelwick (1975), Al-Hoory (1976), and Campbell, Converse and Rodgers (1976). Unsuccessful attempts to confirm the hypothesis have been reported by Kawakami (1967), Buckley (1969), Berkey (1971), Carey (1974), Weston (1974), Hibbs (1975), Newton (1976), Wantz (1976), and Morgan (1976).

Although some people (e.g., Pelz and Andrews, 1976) use the terms 'expectations' and 'aspirations' as synonyms, there are good logical and experimental reasons for avoiding such usage. This was recognized clearly in the early studies of Lewin et al. (1944). Logically or conceptually there is a difference between what one aspires, hopes, wants or would like to achieve and what one expects to achieve. For example, underdog candidates for all sorts of positions may have high aspirations but very moderate expectations. They need not, of course, but it is logically possible and it often happens. Aspiration implies a conative element that is lacking in expectation. One has an emotional or affective stake in aspirations that may be entirely missing from expectations. (Edwards and Tversky (1967) is a good place to begin exploring studies of the impact of desirability on probability assessments.)

The fundamental logical distinction between expectations and aspirations is supported by the experimental literature. While we have just seen that the hypothesis regarding satisfaction as a function of the gap between expectation and achievement has had at best equivocal success, the hypothesis regarding satisfaction as a function of the gap between aspiration and achievement has been almost uniformly successful. Using the same computerized bibliographic search procedures that uncovered the mixed reports about expectation and achievement, I found only a single unsuccessful attempt to link satisfaction to an aspiration-achievement gap, namely, Carpenter (1973). Successful attempts to find an association were reported by Thibaut and Kelly (1959), Patchen (1961a, 1961b), Cook (1968), Bharadwaj and Wilkening (1974), Thompson (1975), Warr and Wall (1975), Campbell, Converse and

Rodgers (1976), Danielson (1977), Dorsett (1977) and Mason and Faulkenberry (1978). 218

Hammer and Harnett (1974) found that satisfaction in a competitive situation was a function of two comparisons which interacted, namely, the perceived achievement-aspiration difference mentioned above and the difference between one's own perceived achievement and that of one's selected reference person. The idea that satisfaction might be a function of the perceived difference between one's own status and that of a reference person or group has received indirect support from Davies (1962), Feierabend, Feierabend and Nesvold (1969), Gurr (1970), Easterlin (1973, 1974), and Scott (1979). Duncan (1975a, p. 273) claimed that "the relevant source of satisfaction with one's standard of living is having more income than someone else, not just having more income." Gurr (1970, p. 52) cited a passage from Aristotle's Politics suggesting the antiquity of the hypothesis.

Campbell, Converse and Rodgers (1976) tested the hypothesis directly using three reference groups (typical Americans, most close relatives and most close friends) and satisfaction with two particular domains (housing and neighbourhoods). In each case they found a positive association between reported satisfaction with the domain, and the gap between respondents' present status and the status of the reference groups as perceived by the respondents. In their most sophisticated model of satisfaction with particular domains of life, these authors have such social comparisons feeding directly into aspirations (as in Lewin et al. (1944, pp. 340-341), with the aspiration-achievement comparison directly related to satisfaction. Exhibit 1 illustrates their model. The most influential comparisons respondents made were not with other people, but with the most liked previous experiences they had had. (See Exhibit 1.)

Andrews and Withey (1976) also tested the social comparison hypothesis directly for one reference group (most people) and three domains (self-accomplishments, housing and national government). In each case they found the anticipated positive association.

Equity theory might be regarded as a particular species of Aristotle's old hypothesis insofar as it is based on a perceived difference between what one gets and what one thinks one is entitled to get, given what some reference person or group gets. As the theory has been developed since Adams (1963, 1965), it has led to mixed results. That, at any rate, is the conclusion reached by three reviewers of the literature, namely, Lawler (1968), Prichard (1969), and Burgess and Nielsen (1974). Abrams (1972) and Strumpel (1972) both claimed that the reported satisfaction of their respondents was partly a function of the perceived equity of their situations. Andrews and Withey (1976) used an item that required respondents to make a judgment about the appropriateness or fairness of their housing, self-accomplishments and national government without necessarily making a comparison to any reference group. That seems to be another species of equity theory, and it at least yielded results consistent with the hypothesis that such judgments do influence reports of satisfaction concerning the three relevant domains.

Some researchers have found a positive association between goal setting and job satisfaction, even if the goals were not achieved, e.g., Latham and Kinne (1974), Kim and Hammer (1976), and Umstot, Bell and Mitchell (1976). Others have found that it is not merely the presence of goals that contributes to job satisfaction (whether the goals are achieved

or not), but it is participation in the goal setting process that is satisfying. (Arvey, Dewhirst and Boling, 1976). According to Umstot, 219 Bell and Mitchell (1976, p. 381), "A conservative weighing of the evidence suggests that goal setting has a strong, positive effect on productivity but an unknown effect on job satisfaction."

Some other theories that have a fairly direct relation to the ideas already discussed include cognitive dissonance theory (Festinger, 1957; Brehm and Cohen, 1962), adaptation-level theory (Helson, 1964; Appley, 1971), expected utility theory (Edwards and Tversky, 1967) and attribution theory (Jones et al, 1971).

3. Next Steps

As the preceding brief overview suggests, there is no shortage of plausible models and more or less developed theories available to account for anomalies of reported satisfaction with various domains and with life as a whole. There are many more models and theories, and there is more experimental evidence than anyone could review in anything less than a long book. Campbell, Converse and Rodgers (1976, p. 287) remarked that by 1972 there were over 3,000 articles, books and dissertations written on job satisfaction alone! Nevertheless, these authors concluded (correctly, I think) that "However worthy generic explanatory constructs like tastes or aspirations may be, they fall far short of providing any very elaborated theory." (Campbell, Converse and Rodgers, 1976, p. 483).

Apart from constructing a "very elaborated theory," there are still some important developmental steps that can be taken. In the first place there is a question of the effects of intercorrelations among measures of satisfaction in particular domains and for life as a whole. Weaver (1978) reported several significant intercorrelations among domain satisfaction scores. He concluded that "The considerable interdependence among domain variables suggests that happiness is based on satisfaction in a number of different parts of life, that the employee whose happiness is significantly related to job satisfaction is also likely to experience satisfaction in other parts of life as well (Weaver, 1978, pp. 838-839). Although Weaver worked with a global measure of happiness with life as a whole rather than of satisfaction with life as a whole, the scores from the two measures generally correlate with Pearson r 's around 0.6 to 0.7 (McKennell, 1978). Atkinson (1979, p. 14) reported that age and income were so highly intercorrelated that "any analysis of one of these factors must proceed with the effects of the other held constant." A systematic search for intercorrelation effects among domain satisfaction scores and life as a whole satisfaction and happiness scores would improve our understanding of such scores, and their change over time.

A second important question concerns the role of an aspiration-achievement gap in the explanation of satisfaction with particular domains and life as a whole. I have already noted that such a gap was found to be influential in reported satisfaction measures for housing, neighbourhoods, self-accomplishments and national government. Mason and Faulkenberry (1978) also found it influential in assessments of satisfaction with income and public safety. As Campbell, Converse and Rodgers (1976) pointed out, so far no one has been able to design a questionnaire item that lends itself to repeated use across a variety of domains that captures respondents' feelings about aspiration-achievement gaps. Consequently, different researchers focus on certain domains and invest the

additional resources required to explore the relevant gaps in the limited areas. Thus, Campbell, Converse and Rodgers (1976, p. 484) concluded that "it remains quite conceivable that the general structuring of standards of comparison and aspiration levels might take quite a different form in other more disparate domains such as financial situation or marriage." A similar suggestion was made by Duncan (1975a, p. 273). In other words, the model illustrated in Exhibit 1 may be appropriate for some domains and inappropriate for others. Clearly, what is required is the design and testing of a new efficient questionnaire item for a variety of domains and for life as a whole.

All previous tests of the hypothesis concerning the influence of an aspiration-achievement gap on reported satisfaction have involved the calculation of the gap from separate measures of aspiration and achievement. These procedures presume that the calculations researchers make are roughly identical to the calculations respondents make. The fact that relatively strong connections have been found between gap measures thus calculated and reported satisfaction measures suggests that the presumption is not entirely unfounded. Nevertheless, from the point of view of the basic assumption behind the study of perceptual or subjective indicators, the perceived gap between one's aspirations and achievements should be more closely related to reported satisfaction than the calculated gap. The gap we calculate for respondents may be significantly different from the gap they perceive on the basis of their own calculations and intuitions. The new efficient questionnaire item mentioned in the previous paragraph should allow us to capture the perceived gap between aspirations and achievements.

4. Guelph Studies

In the summer of 1979 Michalos (1980c) undertook a survey of the office, clerical and technical staff at the University of Guelph in order to help pave the way for some of the crucial research steps just described. Substantial support was found for the explanatory model illustrated in Exhibit 1. The implications of confirmation of the postulated relations in this model are profound. Insofar as this type of model can be substantiated, human satisfaction is not just a brute fact to be accommodated like the wind and rain. It is to some extent manageable in the best sense and manipulable in the worst sense. By providing relevant experiences and information, people's goal-achievement gaps may be altered, with their satisfaction levels not far behind. Campbell, Converse and Rodgers (1976, pp. 149-150) note that a tyrant might try to inflate the satisfaction levels of his or her subjects by restricting their experiences or giving them false reports about the status of their peers. Packard (1957), Key (1973), Michalos (1978a) and many others have argued that advertisers have attempted with more or less success to manipulate satisfaction and demand by providing unrealistic norms, e.g., strange guests who inspect glasses for soap marks, sniff carpets, squeeze toilet tissue, stroke the dust from table tops, and so on. Confirmation of this model provides a picture of the psychology of satisfaction that is a necessary condition of carrying out such manipulation.

Insofar as satisfaction is generated as this model indicates, education and individual initiative have a fundamental role to play in the development of the good life for individuals and societies. Accurate perceptions of the real world have a vital role to play in the determination of satisfaction with that world. The proverbial Fool's Paradise may

be regarded as the result of experiencing uninformed or misinformed satisfaction. Thus, if knowledge is a reasonable thing (i.e. something to which principles of sound reasoning are applicable), then so is satisfaction, taste, etc. Here the dreams of all naturalistic value theorists loom large. Values may be psychologically connected to facts roughly as theoreticians have held they ought to be logically connected. Again, unfortunately, this is not the place to examine these implications, though one ought to be aware of them. (Michalos, 1976; 1980a, Chapter 1 address some of the issues.)

As these words are being written, a field survey involving over 500 senior citizens in rural Ontario (Huron County) is taking place. The potentially powerful explanatory model described here will be tested on the rural elderly. It is hoped that this research can be carried out on a still larger scale in Ontario and Canada.

Exhibit 1. Campbell, Converse and Rodgers (1976) model
of satisfaction with particular domains as
a function of comparisons and an aspiration-
achievement gap.

Comparisons with*



* Comparisons are listed in order of their influence on aspirations.

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Burgess, R.L. and J.M. Nielsen (1974). Distributive Justice and the Balance of Power. American Sociological Review, 29, 427-443.

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Burkey, R.E. (1971). Effect of Discrepancy Between Expected and Actual Supervisory Behavior on Worker Performance and Job Satisfaction: An Empirical Study. Columbus, Ohio: Ohio State University, doctoral dissertation.

Campbell, A. (1972). Aspiration, Satisfaction and Fulfillment. The Human Meaning of Social Change. (ed.) A. Campbell and P.E. Converse. New York: Russell Sage Foundation, 441-466.

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This paper addresses the question of the possible research-laden paths to development of social indicators for public policy making and evaluation.

The first half of the paper will hopefully provide the "background" for the understanding of what I think the social indicators approach encompasses. The second half will deal more directly with what is required to bring this approach closer to the public policy formulation and making processes.

It is worthwhile noting the generalized definitions used to characterize social indicators. An exemplar of a general definition of "social indicator" is that used by Richard Stone:

"social indicators relate to some area of social concern and they may serve the purposes of curiosity, understanding or action. They may take the form of simple data series or they may be synthetic series obtained by applying a greater or lesser amount of processing to data series ... Social indicators form a subset of the data series and constructs actually or potentially available and are thus distinguished from other statistics only by their suitability and relevance for one of the purposes mentioned."⁽¹⁾

That used by the OECD is somewhat similar:

"A social indicator is a direct and valid statistical measure which monitors levels and changes over time in a fundamental social concern."⁽²⁾

My own preference is for my own definition:

"A social indicator is a measure that allows us to judge our progress as a nation (or province or municipality) toward a social goal that the

(1) United Nations Secretariat, Towards a System of Social and Demographic Statistics (prepared by Richard Stone), New York, 1973 (ST/STAT. 68) (published in revised form in Studies in Methods, Series F, No. 18, New York, 1975).

(2) Measuring Social Well-being: A progress report on the development of Social Indicators, OECD, Paris, 1976, p.14.

nation (province, municipality) has explicitly or even implicitly embraced; and where an increase in our distance away from that goal is perceived as a definitely negative or problematic state of affairs that warrants organized attention."

In any event, social indicators are essentially measures of well-being and their definition is not something that should be dwelt upon at length. What is important to grasp is the distinction between social indicators and social statistics -- between indicators and data. For example, the measurements of a rapidly declining blood pressure of a patient remain data until they are seen by someone with enough understanding of physiology to recognize them as indicators of a change, for better or worse, in the state of health.⁽³⁾

Indicators result from a complex interaction of theory and measurement, and the term "indicator" is properly reserved for measures that reflect hypotheses generated by theory and tested in empirical data. For example:

- If he has spots of this sort, he most likely has measles (spots + theory → indicate → measles);
- If the SO₂ concentration goes above a certain level, the air in this city will be dangerously polluted (high SO₂ + theory → indicate → dangerous pollution).

Indicating cannot be accomplished outside of a theory or set of beliefs (these are not always easy to make explicit). This presupposes the selection and interpretation of data, identifiable social forces at work, and ways to manipulate those forces.

The word "social" in "social indicators" is present partially to demarcate the social from the economic. In strictest terms, this is an untenable dualism, but it is indicative of the attempt to break free of the postulates or thinking behind classical economic theory. It reaches out for information and understanding (theory) that bring more to bear upon public policy decision making than costs and distribution of economic benefits.

⁽³⁾ Example from "Can Science be Measured?" by Gerald Holton in Toward a Metric of Science: The Advent of Science Indicators, ed., John Wiley and Sons, New York, 1978, pps. 52-53.

The word "social" also indicates that the discourse is or should be relevant to individual (and societal) well-being and welfare -- hereafter referred to as WB. Indicators will always be couched within some theory or other -- not some all-encompassing macro social theory (which would most likely include all of economic theory) but theories about what elements, activities, processes, states, etc., make up our national/provincial/municipal/social well-being or welfare, and how they contribute to it. Usually the guiding theories are specific to social concerns or domains such as education, health, public safety, etc. Indicators are imbedded in theories about the workings and interactions of human-created social subsystems that either augment WB or keep it from being excessively disturbed.

What Were the Original Ideas That Underlay the Social Indicator Movement?

Impetus for the work on social indicators is part of the general movement toward better quantitative and qualitative information of social conditions, trends, processes and social welfare. This is not a new movement, for it has always been part of the rationale of the collection of social data, but renewed interest seems to have emerged during the 1960s, and a second wave of interest as we begin the 80s. The guiding principle to this renewed vigour was the ancient intuition that there should be a more rational decision procedure behind public policy. A set of indicators dealing with the social aspects of society, in parallel or as a complement to the economic indicators, would be ideal.

The earliest expressions of social indicator ideas by Gross,⁽⁴⁾ Bauer,⁽⁵⁾ and Bell⁽⁶⁾ were clearly efforts to provide decision-making tools for high-level social policy makers. Gross was attempting to develop tools that would assist in the management of social phenomena in a manner analogous to the way economic indicators and analysis were being employed in the management of the economy. Bauer tended to view social indicators in terms of information system analogy: social indicators were to be key data elements of a strategic planning information system. Bell saw social indicators as a comprehensive cost/benefit analysis of key social issues. However, given this similarity, each had another set of purposes in mind.

(4) Bertram N. Gross, The State of the Nation: Social Systems Accounting, New York, Tavistock Publications, 1966.

(5) Raymond A. Bauer, Social Indicators, Cambridge, Mass., The MIT Press, 1966, and "Societal Feedback", The Annals, Vol. 373, Sept. 1967, pp. 180-192.

(6) Daniel Bell, "The Idea of a Social Report", The Public Interest, 15, Spring, 1969, pp. 72-84, and "The Adequacy of Our Concepts" in Bertram N. Gross, Ed., A Great Society?, New York, Basic Books, 1966, pp. 127-161.

Gross saw social indicators as a way to stabilize the new political commitment of the 1960s. Bauer saw his information systems as anticipating new social problems and concerns. Bell viewed his microscopic cost/benefit analysis as introducing new values and concerns into the policy process. In effect, they envisioned planning tools that would not only assist decision makers, but accelerate the process of political change by systematically introducing new values and interests into the processes of policy formulation.

From this point we move to the present state of the art wherein social indicators can be thought of as indexes of ultimate societal outcomes -- the degree to which society produces results which generate increments in objective well-being and satisfactions for its members.⁽⁷⁾ Early work within the social indicators movement relied upon aggregate social statistics of an objectively observable nature.⁽⁸⁾ Examples include measures of health status, such as disability-free days, infant mortality rates, and longevity; measures of security, such as victimization rates; and measures of family cohesiveness, such as divorce rates. The normative interpretation of these measures was usually taken to be self-evident although disagreements sometimes arose. (Higher divorce rates were assumed by most to imply a lower 'quality of life', for instance, but not by all.) The linkage between these observable measures and the subjective satisfactions which were supposedly associated with them typically was left implicit.

A concern with making public policy choices more rational and well-informed led to a focus on outcomes which could conceivably be manipulated by public policy: that is, on the level of skill development resulting from the educational system, on the health status of the population as maintained by the health-care system,

(7) Much of the following discussion of the history of the social indicator movement is taken, in some cases directly, from "Social Accounting and Social Indicators", by F.T. Juster, P.N. Courant, and G.K. Dow, ISR Michigan, 1979, unpublished.

(8) The explicit normative use of aggregate statistics as social indicators began in response to the shortcomings of GNP as a welfare measure. Some representative references are U.S. Department of Health, Education and Welfare, Toward a Social Report, U.S. Government Printing Office, Washington, D.C., 1969; Raymond Bauer, Ed., Social Indicators, MIT Press, Cambridge, MA, 1966; L.D. Wilcox, et al, Social Indicators and Social Monitoring, Jossey-Bass, San Francisco, 1972. Mancur Olson, Jr., "The Plan and Purpose of a Social Report", Public Interest, Spring 1969; Eleanor Bernet Sheldon and Wilbert E. Moore, eds., Indicators of Social Change, Russell Sage, New York, 1968; and Bertram M. Gross and Jeffrey D. Straussman, "The Social Indicators Movement", Social Policy, September-October 1974.

on the level of personal security as maintained by the police and judicial system, and so on. However, just as the linkage between objective measures and subjective satisfactions was left implicit, so too was the linkage between actual policy options and the objectively measured 'state of society' or 'quality of life'. The movement was not notably successful in specifying the technology by which resource use could improve life quality as measured by social indicators.

More recent writers have addressed themselves to these two gaps. The linkage between objective conditions and subjective satisfaction has recently been brought out as an explicit problem to be investigated. This has led, logically enough, to the proposition that 'real' social indicators ought to be measures of subjective satisfaction with various domains of life, a subject examined by writers like Bradburn, Cantril, Campbell, Converse and Rodgers, and Andrews and Withey.⁽⁹⁾ Their collective view is generally that objective conditions are interesting only insofar as they influence satisfactions; they see objective conditions as 'intermediate' social indicators, while subjective measures register 'final output'.

Other writers have addressed the problem of how resources ought to be used to achieve social goals, with the goals typically being indexed by conventional social indicators. This tendency in the literature is best exemplified by the work of Terleckyj and his associates on modelling tradeoffs between societal goals at a macro level.⁽¹⁰⁾ This work explicitly introduces the notion of constrained societal resources which must be allocated among alternative activities in order to achieve socially desirable results. Terleckyj's research, in common with earlier social indicators literature, devotes considerable attention to government as an agent for influencing social well-being through policy choices.

There has been some retreat from the purely macro-level, aggregative approach of the early social indicators movement. Instead, there

(9) The construction of 'subjective' social indicators is exemplified by F. Andrews and Stephen B. Withey, Social Indicators of Well-Being in America, Plenum, New York, 1976; and Angus Campbell, Philip Converse, and Willard Rodgers, The Quality of American Life, Russel Sage, New York, 1976; Bradburn, N.M., The Structure of Psychological Well-Being, Aldine Press, Chicago, 1965; and Cantril, A.H. and Roll, C.W., Jr., Hopes and Fears of the American People, Universe, New York, 1971.

(10) Nestor E. Terleckyj, Improvements in the Quality of Life: Estimates of Possibilities in the United States, 1974-1983, National Planning Association, Washington, D.C., 1975.

has been interest in generalizing the traditional optimization models of economists to ranges of social activity beyond economic behavior. While much of this work remains in the spirit of the original social indicators movement, it shares the concern of Terleckyj, et al, with resource constraints and problems of allocating scarce resources among competing goals. This concern with the micro-level is characteristic of work by Karl Fox and of Juster, Courant and Dow.⁽¹¹⁾

A system purporting to have policy usefulness must not only provide a method for classifying behavioral and social subsystem data, but must also articulate the connection between such data and well-being.

It is becoming clear that people have a variety of relatively uniform concerns which we can call 'welfare elements', 'social concerns', etc., and include concerns with health, personal security, social belonging, and so forth. Welfare elements are ordinal in nature and are not directly observable. It is not possible by observation to determine how 'well off' someone is with respect to health or security, or to what extent Canadian society satisfies his or her sense of social justice. There are two methods which can supply observable indices of these welfare elements, i.e., indicate whether a person is better or worse off with respect to some concern. One method is to employ some set of physical measures of time uses, stocks, processes, and tangible flows to create an ordinal index of how well each concern is being met. For instance, if the index of 'security' increased for an individual without any decrease in other indices of welfare, one might conclude that this change was ambiguously good. A difficulty is that construction of these indices necessarily involves selection of a set of observable measures and an assignment of weights by the analyst, so that the method is not so objective as it might appear.

The other method of attack is to index welfare elements by a person's stated satisfaction with each domain of concern. Here the reports of individuals regarding their subjective states assume primacy. If someone reports greater satisfaction with respect to some concern or welfare element, this would be taken as an indication that the person is better off. However, this method is no more free of

⁽¹¹⁾ Karl A. Fox, *Social Indicators and Social Theory*, John Wiley & Sons, New York, 1974; and F. Thomas Juster and Paul N. Courant, "Social Indicators and Social Accounts: Outlines of a Comprehensive System for Understanding Social and Economic Change", 1978 Proceedings of the Social Statistics Section of the American Statistical Association, Washington, D.C., 1978.

difficulties than is the construction of seemingly objective indicators. As is well known, subjective statements do not always correlate well with other conceptions of well-being. Complex mechanisms involving aspirations and expectations intervene between objective circumstances and subjective states. One may find roughly the same levels of satisfaction reported by people in very different objective circumstances, provided that people have had sufficient opportunity to adapt to their respective environments.

It is probably not desirable to choose a single method for indexing welfare elements. Individuals should probably be characterized both by objective attributes and subjective reports at various points in time. The linkages between subjective and objective social indicators must be investigated empirically.

How does one determine the elements in individual and, by implication, societal welfare functions? The closest one can come to a systematic classification of such elements is probably the lists of 'social concerns' compiled by various nations in the course of creating social indicators, along with the categorizations of important life domains that emerge from the work of social indicator theorists.

Other sources of information on welfare elements are the revealed preferences of individuals in society, which in fact underpin many of the current lists of social concerns. For example, we know that people prefer to be in good health rather than poor health, since their behavior indicates a willingness to use resources to improve the state of their health. Similar arguments can be advanced for the inclusion of material comfort in a list of welfare elements. This approach becomes more suspect when collective choices are concerned, but to some extent the activities of governments can be treated as a reaction to preferences of voters.

Any list of elements in individual or societal welfare functions must be derived from some combination of the thought of others, the use of survey techniques, revealed preferences as best one can determine them, and introspection on the part of those compiling the list. The good life does not mean the same thing to everybody, but hopefully by these methods it is possible to capture the major concerns of a large number of people.

One classification is that suggested by Juster *et al.*,⁽¹²⁾ shown below in Table 1. It reflects an attempt to synthesize sets of

(12) F.T. Juster, P.N. Courant, G.K. Dow, "Social Accounting and Social Indicators", Institute for Social Research, The University of Michigan, unpublished paper.

social concerns coming out of the social indicators movement, the findings of social indicators researchers such as Campbell-Converse and Andrews-Withey who have attempted to map domains of concern to the general public, and the thinking of social scientists like Parsons and Mack, who have attempted to create classifications for use in the analysis of tradeoffs involved in public policy decisions.

It is an example of what seem on balance to be the principal objects of societal activity and energy, and constitutes one way to link societal states to the flow of psychological satisfactions enjoyed by individuals.

The welfare elements shown in Table 1 can be compared with existing collections of either objective or subjective indexes of well-being. Table 2 provides a summary of the OECD list of social concerns, taken from working papers prepared by the OECD Committee on Social Indicators. The OECD classification of concerns tends to reflect the jurisdictional areas encompassed by public programs -- health, education, public safety, income security, environment, etc.

Frank Andrews and Stephen Withey in their Social Indicators of Well-Being in America⁽¹³⁾ work toward subjective social indicators by measuring the strength of association among questionnaire items dealing with a variety of dimensions of life satisfaction. From their data they derive clusters which represent identifiable satisfaction domains. A somewhat familiar approach is used by Campbell, Converse, and Rodgers in their Quality of American Life⁽¹⁴⁾

The links between the elements of well-being in Table 1, the objective conditions of the population reflected by the OECD social concerns in Table 2, and subjective perceptions need to be better understood and more work in their realm should be encouraged. Canadian work on satisfaction is being carried out at York University by The Institute for Behavioral Research, and their results may provide a focus for Canadian research activity in this area. Some work has also been carried out at the provincial level by The Alberta Bureau of Statistics.

As noted above, the OECD objective data on social concerns tend to have a flavor of concerns that are susceptible to public policy impact. One need we have relating to this impact is an investigation of the potential for analyzing the degree to which public policies have reduced impact on societal and individual well-being because of a tendency to substitute public resources for private resources

(13) F. Andrews, S. Withey, Social Indicators of Well-Being in America, Plenum, New York, 1976.

(14) Campbell, Converse and Rodgers, The Quality of American Life, Russell Sage, New York, 1976.

TABLE 1
The Elements of Individual and Social Well-being

| <u>Principle Elements:</u> | <u>Sub-Elements</u> |
|------------------------------|---|
| 1. SUBSISTANCE | nutrition; shelter; moderate temperature, personal cleanliness; sleep |
| 2. SECURITY | low probability of personal assault, attack on property; high probability that family, friends and governments will render aid in time of need; personal consumption security |
| 3. ORDER AND CONTINUITY | high probability that the economic system will continue providing the elements of subsistence and the means of their purchase; high probability that governments will continue to create orderly and stable environments and enforce the law quickly, uniformly and justly; high probability that the health delivery system will prolong life; intergenerational transmission of culture, values and traditions; orderly, well-administered households (cleanliness) |
| 4. VIGOR AND VITALITY | physical and mental keenness; longevity; freedom from physical and mental impairment |
| 5. PERSONAL SATISFACTIONS | pride in self, family, friends, community, nation; job satisfaction; pride in home; self-importance; challenge in life; achievement |
| 6. SENSE PLEASURE | absence of pain, both physical and emotional; enjoyment of beauty, of being, or taking part in activities; enjoyment of physical exercise, mental exercise; fun and relaxation |
| 7. DECENT STANDARD OF LIVING | pride in physical possessions; satisfaction with command over resources; satisfaction with relative social standing; decent standard of living for others |

(cont'd.)

TABLE 1
The Elements of Individual and Social Well-being
 (concluded)

| <u>Principle Elements</u> | <u>Sub-Elements</u> |
|--|---|
| 8. GOOD RELATIONS WITH FAMILY AND FRIENDS | harmonious relations with and positive feelings towards spouses, children, parents and relatives, friends; stable and satisfying marriage |
| 9. SOCIETAL BELONGING AND RECOGNITION | acceptance by, identification with and respect from others; opportunities to meet people and interact socially; opportunities to make contributions to the group and gain recognition |
| 10. COMPETENCE AND MASTERY | successful acquisition of market and non-market skills; ability to function in society |
| 11. HOPE FOR THE FUTURE | opportunities for advancement of one's social status and standard of living; for one's children to advance; peace, both at home and abroad |
| 12. FREEDOM OF CHOICE | opportunities to acquire new skills, take part in decisions that affect one's range of options; freedom of choice in time use |
| 13. PURPOSEFULNESS | variety in life |

Source: Juster, Courant, and Dow, Ibid.

TABLE 2
Summary of OECD Social Concerns*

| <u>Concern</u> | <u>Sub-concerns</u> |
|--|--|
| A. HEALTH | probability of healthy life health impairment |
| B. INDIVIDUAL DEVELOPMENT | skill and knowledge development opportunities satisfaction with development process cultural heritage |
| C. EMPLOYMENT AND WORKING LIFE | availability of employment quality of working life satisfaction with work experience |
| D. TIME AND LEISURE | availability of choice |
| E. PERSONAL ECONOMIC SITUATION | personal income and wealth deprivation protection against hazard |
| F. PHYSICAL ENVIRONMENT | man-made environment environmental nuisance natural environment |
| G. SOCIAL ENVIRONMENT | attachments |
| H. PERSONAL SAFETY AND JUSTICE | victimization treatment of victimization administration of justice |
| I. SOCIAL OPPORTUNITY AND PARTICIPATION | inequality participation |

*This summary is constructed from a "Provisional Working List of Social Concerns and Indicators" compiled by the OECD.

that would otherwise have been used to accomplish the same objectives. For example, social security programs may make the elderly less well off than would be indicated by an increment in social security transfers; that is, family sources of support, which otherwise would have sustained older people, may be withdrawn as public sources expand. Thus, the elderly may not be as much better off as the increased social security transfer would suggest, since there are reduced private sector contributions, either in cash or in kind. Similarly, programs designed to increase skill levels among children -- public nursery schools, kindergartens, special programs for above-normal or below-normal youngsters -- may have less impact on skill development because family resources are withdrawn as these programs come into existence or grow in size.

As a research strategy, the most sensible line of inquiry would be to determine how objective conditions are shaped by resource inputs, and then try to associate these objective conditions with the affective states and perceptions which relate to those conditions. Thus, disability-free days or longevity are determined by inputs of medical care, diet and exercise, as well as stress situations originating in job, family or other circumstances. Subjective perceptions of health status in turn ought to be related to these objective measures of health conditions, though the links will not always be very precise or robust.

Another set of issues in the area of measuring elements in well-being, relating mainly to the subjective perception measures, is the problem of measurement reliability and validity. This problem is much less important for the objective variables, where validity and reliability problems seem no more severe than in other parts of the system. But in the subjective perception area, one could imagine measures geared to some kind of typical or average state of mind, measures geared to states of mind associated with small changes in circumstances, measures geared to the presence of positive perceptions rather than the absence of negative perceptions, or measures relating to the frequency of strongly positive states or strongly negative ones, but not to typical states. These topics have all been investigated by social indicators researchers, but there seems to be less consensus here than in the measurement of objective conditions.

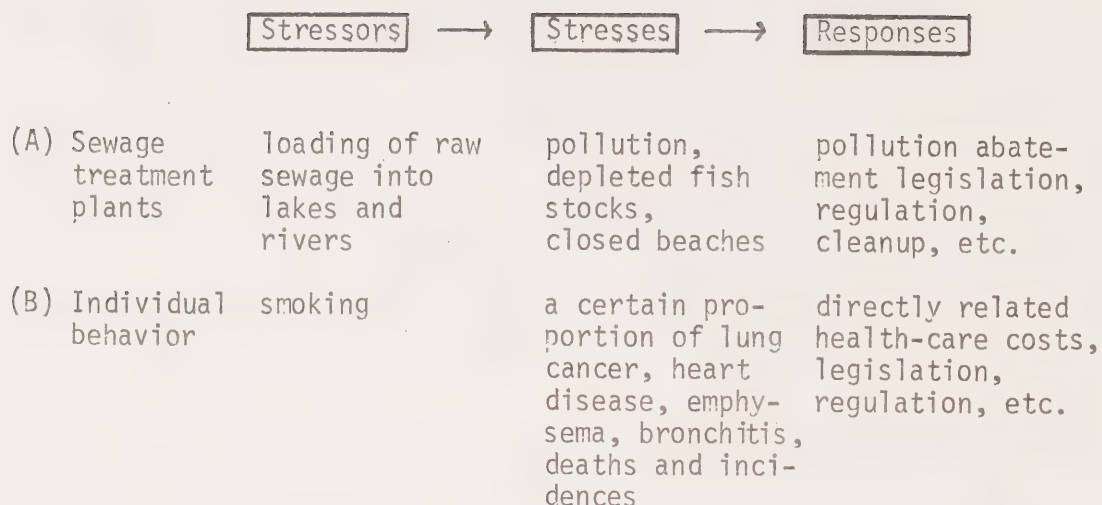
Since welfare elements themselves are not observable, the problem of developing objective social indicators is essentially the problem of identifying the observable features of the world which influence WB.

Proper social indicator development requires a differentiation between measures of change in welfare/well-being from more ordinary

social changes brought about by social forces/dynamics, some of which may be independent of policy-guided attempts to augment or stabilize WB. In short, any theory of social indicators presupposes dynamic models of the social processes, e.g. getting educated, earning a livelihood, maintaining health, etc., and a theory of what social forces have an effect upon these systems and how they interact. For example, the process of "getting educated" may be dynamically influenced by health, age, race, class, income, etc. Such social-system modelling could also provide a basis for statistical tracking systems for following the flows of individuals through such systems. There is some subsystem modelling being carried out in North America, perhaps most notably by Ken Land and Marcus Felson at the University of Illinois-Urbana, but also by The Economic Council of Canada, Statistics Canada, and some Canadian Government departments. There is a need for much more modelling of this sort to permit exposure of the impacts on WB of government policies directed toward target groups within the social systems.

Apart from the need for more system modelling, attention also needs to be paid to both the differences in WB and contributions to WB that are a function of or dependent upon the life cycle. The life cycle is an important dimension of the present characterizations of our human society and to fully understand welfare/well-being (WB) almost certainly requires the understanding of the different life situations that comprise the life cycle.

The conceptual grounding of social indicators, i.e., of well-being/welfare is in need of additional thought. Competing views of how to think about welfare, welfare elements, etc., must be brought forward in sufficient numbers to allow synthesis of a comprehensive and usable system to emerge. Some work at Statistics Canada, for example, has concentrated upon WB in terms of societal stresses. In brief, well-being is maximized by (A) the measurement and correction of identifiable social stresses and (B) by the increment of elements of well-being. The view holds that agents or "stressors" can be identified that exert stress or impact upon individual well-being. Individuals and governments respond, or should respond, to these stresses via public policy action, and this whole process is in theory describable and, where necessary, quantifiable.



Work on conceptualization and measurement of elements of well-being and stress factors is now under way.

Revisions, alternate approaches and the testing of theories with actual data must continue if the social indicator approach is to provide a tool for assisting public policy creation and evaluation.

Beyond this work, a general framework and lists of annual, biennial and quinquennial indicators collectable via household survey were identified for Statistics Canada by The Institute of Public Affairs at Dalhousie University.⁽¹³⁾

Social indicators would be collected via three instrument methodologies. Standard survey instruments (including checklists, attitudinal scales, etc.), time budget diaries, and a life history matrix. A life history matrix is a time log of an individual; migrational, occupational, educational, and family history.

Statistics Canada has not adopted this framework, but it serves as an input into work on potential modification and uses of household surveys.

Social Indicators and Public Policy

Part of the task in social indicator development is to change the present models of societal development. Development of human resources and growth has been traditionally economically-led. As

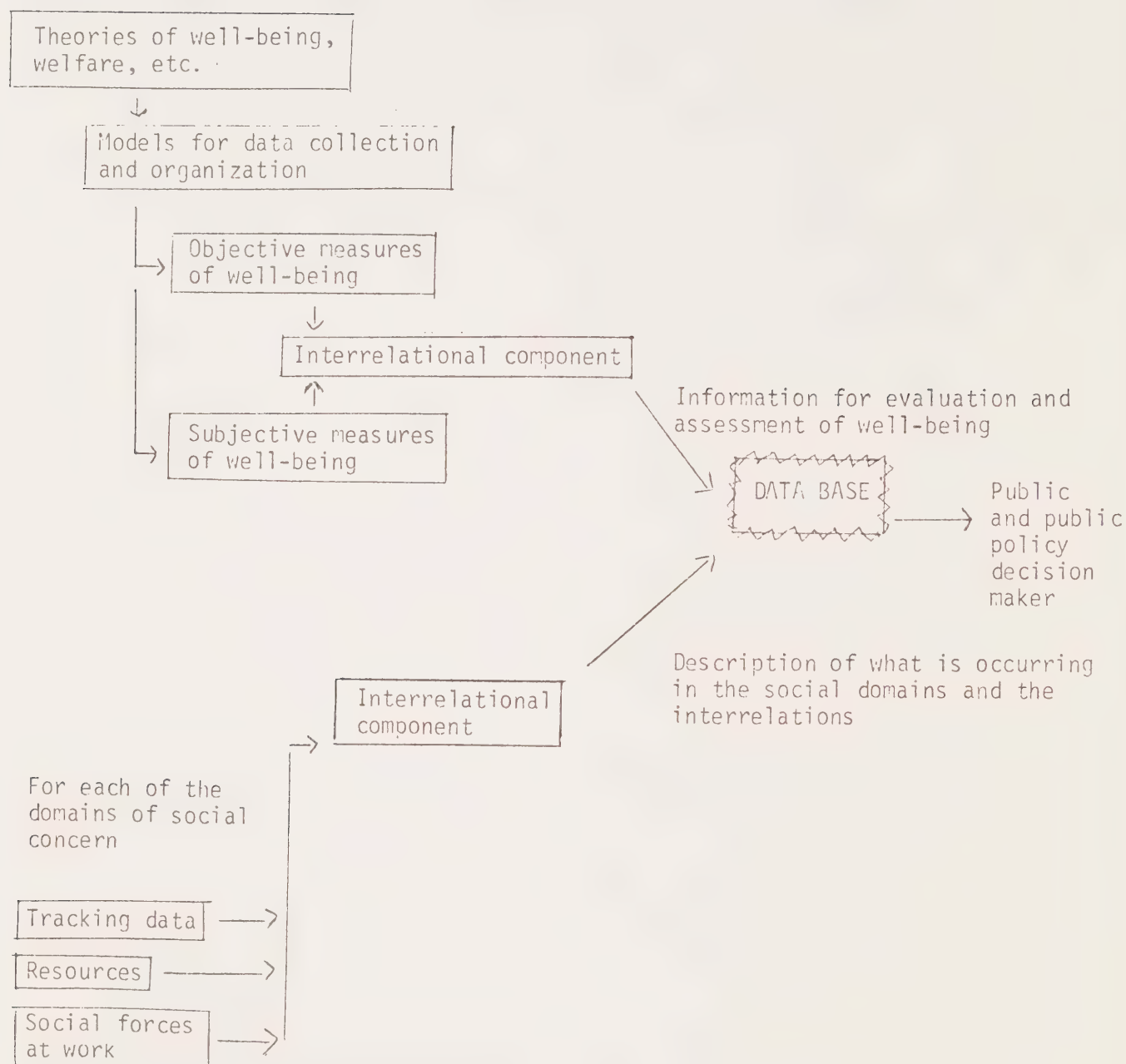
(13) "Blueprint of Core Social Indicators", A. Harvey, et al., Institute of Public Affairs, Halifax, 1978. Unpublished.

this wains, some guidance for socially-led development must emerge which changes the ways of thinking about traditional problems and the allocation of resources. This is not the place to develop such a strategy, but I wish the reader to note that the adoption of a usable system of social indicators will most likely require such an openness of mind on the part of the countries' elected decision-makers and their advisory staffs.

Figure 1 represents a view of the relation of indicators to social policy. The line between the data base and the public policy decision-maker is one of many that are in severe need of explication. If a data base is prepared for use in public policy decisions in absentia from the decision-maker, it is possible and probable that while the creators think this information is 'relevant', it is not relevant to the decision-maker who either thinks in different terms or wishes to know different things. I do not, however, think that the decision-maker always knows what information he needs; nor is it the job of the information providers to provide only that. In some cases he knows exactly what he wants, but in many cases he simply does not, or is satisfied with or simply uses what is easily accessible. In other cases the decision-maker sees information generated in published form as irrelevant because it is too far out of data. This last problem may be alleviated by two factors. First, social changes supposedly occur more slowly than economic ones. This is partially true, and will work for us. Second, once social indicators are theoretically grounded and accepted, and capable of use by decision-makers, it will be somewhat easier to bring resources to bear on the collection and delivery of these series. We still, however, require some specification of the relevant time frames for changes in different social indicators. An indication of some sensitivity to this question is demonstrated in the list of social indicators suggested by the Dalhousie Institute of Public Affairs. Some are to be collected/compiled yearly, others only every five years, etc.

The other problems of providing useful social indicators are more complex. They involve bringing the decision-maker's needs for decision-related information into consideration within the indicator development process; seeing that the decision-maker adopts the views and strategies implicit in the correct use of social indicators (maximization of WB, socially-led development rather than economically-led, reduction of stressors, etc.); understanding the process for public decision making as it now stands, and would differ using a social indicator approach; and finally, bringing indicators into play. These are difficult tasks to accomplish by persons or groups who are not closely linked to public policy decision-makers, or who are not capable of having others influence them. Obviously, some influence can be brought about through the media and interest

FIGURE I



does not appear to be an optimal way of bringing about changes in thinking with respect to public policy. What is needed is some strategy for bringing about the appropriate ends and a significant test of its potential in at least one area of social concern, or with several public policy decision-makers. Consider, for example, deriving social indicators from The Canada Health Survey (CHS) and attempting to detail their influence on and use in public policy in the social domain/concern area of health. Such an exercise might provide one example of the use of social indicators as long as the appropriate indicators could be developed and the connection made with the public policy process.

An issue related to the making of public policy which has not been given a great deal of attention is the packaging of social indicators and the attendant theory for the public and governing bodies/individuals.

It is often assumed in work on social indicators that the proposed indicators are obviously 'relevant' to the decision-maker, and that their presence in this or that journal or a national-level publication counts as an input into the decision-making process and the public forum. Sometimes this may be true, but more often than not it does not appear to be borne out by what evidence exists. We do not at present know whether the indicators given in lists like those in this paper are actually relevant from the point of view of the policy-maker and whether he is equipped to use them the way we think they should be used, let alone the way he might think they should be used.

One of the things we do not understand in sufficient depth (and by "we" I include some policy-makers), is the process, or the diversity of processes, by which public policy is made at present. And the process by which it "should" be made (subject to real constraints). Debates over the importance and use of Gallup polls, and now satisfaction surveys, is the tip of the iceberg in the realm of the use of stated public preferences in public policy decision making. Should satisfaction data dealing with a social concern or domain be part of the process of making decisions, usually involving resource allocations, which we would characterize as public policy decisions? The answer is not patently obvious. It could be partially resolved through research that made clear the relation between objective and subjective indicators in both word and example. (This problem refers to the interrelation components in Figure I.)

The central substantive question in the use of social indicators in the public policy process -- that of the identification of specific indicators, welfare measures, dynamic models, etc. -- can be assisted by the articulation of the desires, aims and needs of various interest

groups. It is one thing for the theorist -- analyst -- to suggest what is needed; it is another to have an interest group articulate its position in a way that points to information needs for description and assessment.

Some of this problem is part of the general problem of the use by politicians and decision-makers of social science data. But part of the problem is the greater hurdle of changing the approaches to modes of thinking and problem solving to ways that are most likely more rational, more informed, and more attuned to the development of individual well-being.

Projects to demonstrate or achieve changes in mindset about public policy problems may well be more valuable than all the public and private pressure that can be brought to bear on a public policy issue in the usual forums.

If we look again at Figure I, we can derive additional task elements in bringing social indicators into social policy making and evaluation:

- present theories of welfare elements, well-being, etc., are in need of evaluation and revision;
- alternate conceptual frameworks (ways of thinking about social issues, ways of organizing information) which make public policy questions more evident, or the tradeoffs more specific need to be brought forth;
- The specification of individual WB as it is a function of (1) the utilization of resources and (2) attitudes (satisfaction, aspirations, expectations) needs to be made clearer;
- additional policy-relevant models of social processes and the creation and utilization of the end products of social processes and systems (educated or healthy persons, etc.) need to be brought forth;
- the data base portion of the social indicator from Figure I would demand additional ways of using both past and present survey data to develop indicators and indicator examples. As well, the exploitation of administrative data to yield social indicators is just beginning. The development of new social indicator series from survey data not specifically designed for that purpose would require increased archiving of present Canadian surveys within government, universities and the private sector, and sufficient attention to documentation to permit recoding and reorganization of data files necessary for secondary analysis.

- Within social domain areas, besides system modelling to permit the understanding of general social dynamics, there is a need to explore processes that operate to increase or decrease WB. For example, in the health domain we require more attempts at the description and quantification of the processes and factors behind health problems -- such as the stresses listed earlier, i.e.,

| | |
|-------------------------------------|------------------|
| smoking → an increased proportion → | increased health |
| (&%) of lung cancer, | care costs, loss |
| heart disease, emphysema | of income, disa- |
| and bronchitis deaths | bility, etc. |
| and incidence | |

- Again, there are things that act upon social systems and domains from outside those areas, e.g., the impending impact of the microelectronic industry upon our economy, individual jobs, working life, and home life in general. While it is impossible to build individual cases like this into a social indicator system, it is possible and necessary to examine such phenomena as they occur and attempt to both understand and lessen their negative impacts.
- The question of who should develop social indicators is not a simple one. On the one hand, the government has much of the data, plus a definite interest in streamlining its collection and organization of data along the lines of public and government policy use and demand. Social indicator development as a refining strategy provides this option. However, there are those who feel that government agencies are too responsive to government sensitivities and would suggest that either an external group, a process involving both government and outside groups, should bear the brunt of the workload.

These are only some of the issues that can be raised about the nature, development and use of social indicators for public policy making. In some of my discussion I have left the implications for SSHRC involvement as a funding agency implicit, in other cases I have been more direct.

The reader who makes it this far is to be congratulated for his tenacity, for the paper lacks organization and touches different issues without being programmatic. However, I hope that as a background document it raises questions, the answers to which will be suggestive for SSHRC funding priorities.

Complementary and alternate approaches to developing social indicators and portraying data in policy-relevant form must be supported if we are to generate enough of this activity in Canada to permit the growth of a group of knowledgeable individuals who can evaluate and refine developmental work and move forward via the mode of intellectual cross fertilization.

David Brusegård, Ph.d.,
Adviser on Social Indicators,
Statistics Canada.

October 1979

SOCIAL IMPACT ASSESSMENT: COPING WITH THE CONTEXT OF OUR TIMES by Frank J. Tester

Ours is a progressively technical civilization committed to the quest for continually improved means to carelessly examined ends.¹

INTRODUCTION

I find it reassuring to note that Ray Jackson, in the preparation of his background study for the Science Council of Canada, *Human Goals and Science Policy*² takes note of this same quotation which I find appropriate to an introduction of this discussion of social impact assessment (SIA) and its relationship to science, technology and human values. The discussion which follows builds around the conviction expressed in this introductory quote.

As will become apparent, I perceive there to be two major and fundamentally different directions that I might pursue in an examination of SIA and research priorities relevant to its development. In turn, these directions are steeped in different 'world views', assumptions about the future, and the 'good life'. On the one hand, I perceive the Social Sciences and Humanities Research Council as requesting a delineation of specific areas for funding and research which build on established traditions and which, in essence, will enable us 'to do better, that which we already do'. There is, however, another more fundamental or 'general' level of concern and potential enquiry. SIA may be seen as a theoretical tool for policy assessment grounded in general tradition with applications in case specific as well as more 'global' situations. I would suggest that a re-consideration of these 'general traditions' may not be compatible with the further development of current methods for assessment.

The former perception implies that the ship is basically on the correct course but needs a *little* course correction and adjustment to the carburetors in order to achieve greater efficiency in the engine room. I would expect recommendations following from this perception to include calls for the development of better systems models, the design and implementation of better monitoring programs, the pursuit of methods of integrating social intangibles with cost/benefit analysis; all of which is intended to better control, regulate, and use the benefits of science and technology, the fundamental direction having been assumed or predetermined. Key words associated with 'progress' in this direction and its underlying assumptions include, incremental, technological, liberal, utilitarian, rational and scientific. If SIA may be regarded as subdividable; that is, micro SIA being concerned with specific projects and short-range futures (2-25 years), and macro SIA being concerned with general directions for society and with 'social futures', this tradition as the macro level may be identified with futurists such as Herman Kahn* and Daniel Bell.

* A clear indication of Kahn's vision of the future is to be found in *The Futurist*, June 1979, Volume 13, No. 3, "The Economic Present and Future, a chartbook for the decades ahead", pp. 2202-211.

However, I perceive another direction we might meaningfully pursue in examining research priorities for SIA, goals for its development and for its role in addressing the potential impacts of science and technology, whether at the "micro" or "macro level", upon Canadian society. This alternative direction suggests that the ship may be on the wrong course and that a more fundamental line of questioning is more appropriate; that in the least, unless we divest ourselves of current assumptions we cannot adequately evaluate current directions to ascertain whether a little 'fine tuning' or some basic changes are in order. It suggests that not only our "ends" but also our roots have been carelessly examined for some time.

It is high time to understand at least two essential things.

One is that mankind as a whole is striding rapidly towards a monumentous crossroads where there can be no place for mistakes; yet, his values, institutions and bearing are all a reflection of the past and certainly cannot carry him safely into the future.

The second is mankind's desperate need to break this vicious circle, while he can still get free and mold his future.

.....The obstinacy with which old, ineffectual if not counterproductive schemes are nevertheless upheld confirms that the entire thought process rather than just the economic system alone, needs a good overhaul.....³

Such views are often unpopular, ultimately threatening to established institutions and often seen as the rumblings and machinations of a few academics and citizens' groups "on the fringe". Given the recurrence of this and related themes in the literature dealing with the future and directions in the debate about objectivity and social science, such themes can no longer be summarily dismissed. There are strong indicators as we venture into the 80's that there is growing concern about the general direction of many aspects of Canadian society. At the micro level of SIA, an increasing role for citizen participation in decision making following the social upheaval of the 1960's can be noted. I shall later comment, however, upon problems with citizen input as it relates to SIA. Attempts to codify and quantify public values for purposes of evaluation are beset with methodological and philosophical problems apart from failing to meet more basic socio-psychological needs for direct and active participation. Technical approaches may therefore be regarded as inadequate substitutes for direct participation. It may be stated that increasing emphasis on citizen participation is indicative of a growing discontent with what is seen as elitist incremental decision making in Western democracies, and a desire to participate and to 'value' more directly.⁴ At the macro level an impressive and growing number of futurists reflect the view that more than 'fine tuning' is in order. These included the late E. Schumacher and Margaret Mead, whose momentum

is reflected in the works of Hazel Henderson, Paul Erlich, Marshall McLuhan, Alvin Toffler and others.

I have therefore tried very generally to define SIA in terms of its 'level' of operation and have placed it within the context of a larger debate about science, technology and directions for society in general. In what follows, I would like to step back momentarily and deal with definitions of SIA, its relationship to other developments in both the social and policy 'sciences', its relevance to decision making in Canada, and then to emerge back at the more general level to suggest current issues and directions for the development of social impact assessment.

DEFINITIONS OF SIA

There appears to be some general agreement among practitioners as to the definition of SIA while it appears that considerable confusion exists among the general public. Much of this is indicative of the 'context of our times' itself and centers about the meaning of the words 'social' and economic'. There is considerable variation however, among practitioners, with respect to the methods and practice of SIA. These variations can be explained in terms of:

- o traditional conflicts and conflicting ideologies within the social sciences.
- o conflicting views and convictions with respect to the future and the role of SIA in shaping the future and in directing or creating social change.
- o conflicting views on the 'nesting' of SIA with respect to environmental impact assessment, economic impact assessment, and technology assessment.
- o differing views of 'democracy' and decision making process and consequently of the role of SIA in decision making or policy formation.

Social impact assessment attempts to predict the future effects of policy decisions (including the initiation of specific projects) upon people; their physical and psychological health, well-being and welfare, their traditions, lifestyles, institutions and interpersonal relationships.⁵ Operational definitions vary from emphasis upon 'product' to emphasis upon the 'process' aspects of SIA. "While many researchers, steeped in the objectivist tradition of the social sciences, would claim that SIA is more product than process, it is evident that SIA can, and in some cases should, in addition to information, produce processes which in themselves are intended to improve quality of life and at the very least, the quality of the information and its application to decision making and policy implementation".⁶ Finsterbusch⁷ equates the primary goal of

social impact assessment with assessments in general as "facilitating decision making by helping to determine the full range of costs and benefits of alternative proposed courses of action including a 'do nothing' alternative". He includes a secondary goal of "improving the design and administration of policies in order to ameliorate the disbenefits and to increase the benefits".

While these definitions are broad there are those who take a more narrow view of SIA, particularly at the 'micro' level as I have defined it. In dealing with development projects, SIA is defined as the social equivalent of environmental impact assessment.⁸

OPERATIONALIZING THE GOALS OF SIA

However, as indicated, it is upon operationalizing the goals for SIA that fundamental disagreements about its basic 'posture' arise. At the *extremes*, SIA may be regarded as intended to bring about *fundamental social change* by creating an *active informed public* through the *processes* involved in conducting assessment and by demonstrating the social costs, benefits and consequences of certain types of decisions. An implicit bias and specific vision of the future can be associated with this view. SIA is seen primarily as *social phenomenon*, orientated toward social change and as questioning the basic direction of the ship.

The alternative view of SIA places it, with other tools of the policy sciences, in a process which is bringing about *incremental changes* and which is concerned with '*fine tuning*' current trends in decision making through improving the *techniques and technology* by which we assess social impacts. An implicit bias and specific vision of the future can be associated with this view. SIA is seen primarily as *social science* orientated toward meeting the needs of *disjointed incrementalism* in policy formulation. These fundamental differences, their systemic implications and related perceptions of democratic decision making are presented in Figure 1.⁹

Orientation toward one polarity or the other, in reviewing social impact assessments conducted in Canada, appears to be a function of three main factors:

- o the 'world' and 'future view' of the researcher as discussed earlier,
- o the level of assessment; micro level analysis being somewhat restricted by definition, to a concern for incremental change,
- o the situation; cross cultural impact assessment necessitating a different level of concern for context and the social position of minorities, lends itself more readily to treating SIA as social phenomenon.

The best known example of this last point is of course the

| Perception of the Democratic Tradition | Resolution of Issues Related to Context | Methodological Approach | Perception of Social Impact Assessment |
|---|--|---|--|
| <ul style="list-style-type: none"> o centralized o recognition of the majority o elitist o management by a strong central bureaucracy | <ul style="list-style-type: none"> o context is that of the majority as perceived by the researcher/manager as a member or servant of the majority o detached and objective observer | <ul style="list-style-type: none"> o sociological/economic o objective o detached observer o mathematical o objectification of experiential reality o S.I.A. as <i>science</i> o structural/functional | <ul style="list-style-type: none"> o S.I.A. as social science research resulting in a specific product containing data for decision making |
| <ul style="list-style-type: none"> o decentralized o recognition of a cultural mosaic o shared power o management at a local level | <ul style="list-style-type: none"> o context is that of the minority or member of the mosaic in question as perceived by the minority and as conveyed by o the participant observer | <ul style="list-style-type: none"> o subjective o participant observer o attention to qualitative factors o participatory o S.I.A. as <i>art</i> o anthropological/existential/gestalt | <ul style="list-style-type: none"> o S.I.A. primarily as a process and only secondarily producing a product, and as social phenomenon relevant to decision making |

FIGURE 1

DICHOTOMOUS APPROACHES TO ASSESSING SOCIAL IMPACTS
AND THEIR IMPLICATIONS

Berger Enquiry. My own recent experience in the eastern arctic¹⁰ is that treating SIA as social phenomenon still brings into conflict the two fundamentally different ways of 'making sense' previously outlined and that our rational, highly scientific culture is having difficulty escaping the limits of its own understanding. Criticisms of this approach to SIA will be examined later in developing potential goals for the development of SIA.

THE SOCIAL IMPLICATIONS OF INDUSTRIAL GROWTH

It appears that much of Canada, with the exception of the 'Golden Horseshoe', may be regarded as in a 'pre-industrial' state. Perhaps for Canadians, there is some parallel to be drawn between industrialization and the mounting social problems of mid 19th century Britain. Even more important, industrialization of the Canadian West is characterized by the commitment of tremendous amounts of capital from both public and private sectors to energy projects. Industrialization in Canada has and continues to be characterized by conflict with indigenous people, regional disparities, now being translated into inter-provincial and federal-provincial conflict, and by all credible accounts, no relative change in disparities between the country's rich and poor, with an actual increase in the gap in the case of some maritime and native populations.*¹¹ The implications for the commitment of large amounts of capital alone are for a serious restriction of future policy options perhaps in more than the energy field. Government 'belt tightening' in the face of high rates of inflation and increasing capital debt is also revealing. In the maritimes, it has been suggested¹² that Government commitment to the Point Lepreau nuclear facility restricts, due to the resultant provincial debt load, involvement in the development of Fundy tidal power. The commitment to large scale development of Alberta's tar sands can be noted in the face of Federal and Provincial cutbacks and 'freezes' on social programs and policies. The commitment is to economic and industrial development. Can such development occur without concomitant to development in the public sector, more hospitals, more doctors, lawyers, social workers, alcoholism, police, vandalism etc? The case for examining our current industrialization and the relationship between the implied technology and human values, in the face of limited resources, is quite clear.

In the current debates about 'growth' and 'economic development', the roles of the public and private sectors in Canadian society, and the notion that 'the 20th century belongs to Canada', a re-examination of the roots of our contemporary ideologies and of industrialization itself is undoubtably in order and has attracted, in recent years, considerable

* Analysis of average family incomes for Keewatin Inuit for example indicates that they were 39% of average Canadian family incomes in 1967 and 48.8% of average Canadian family incomes in 1978. However, more than just this difference can be accounted for by federal transfer payment in cash and in kind. In addition, family sizes are greater as well as inflationary pressures in this relatively isolated arctic region.

academic attention. Such a re-examination is also relevant to coping with debates about the theory and methods, technology, and objectivity of SIA, although, paradoxically, to say so is to lend credence to the view that SIA is contextually biased.

SIA AND THE 'POLICY SCIENCES'

SIA is only one of a proliferating number of areas of research and development which have arisen since the second world war as a result of the birth, development and refinement of the policy sciences, more appropriately and commonly known prior to this period in our history as 'political philosophy'. The policy sciences have, as Torgerson¹³ notes, given an "aura of neutrality" to themselves in what Laurence Tribe describes as the myth "that the techniques (of policy science) in themselves lack substantive content, that intrinsically they provide nothing beyond value-free devices for organizing thought in rational ways -- methods for sorting out issues and objectively clarifying the empirical relationships among alternative actions and their likely consequences".¹⁴

It is not surprising that the 'policy sciences' have flourished since the second world war. As Ray Jackson has explained, national goals during the second world war were clear and consistent in their focus upon the war effort and became less obvious thereafter.¹⁵ The problems of deciding among competing courses of action while difficult, followed and are following in the already established economic traditions of the Western world and notably of Britain and the United States, placing major importance upon industrial expansion and economic growth. In Canada, as had occurred initially one hundred years earlier in Britain, the growth ethic of the post war decades had a profound initial, seemingly positive effect upon the quality of life. However, in Canada as elsewhere, by the mid nineteen sixties the costs and disbenefits associated with growth and development, particularly the environmental costs, were mounting rapidly. Toward the mid and late nineteen seventies, the social problems associated with Canada's peculiar brand of development, notably 'frontier' development became more apparent as witnessed by increasing conflict with native people and regional calls for more control, power and authority, particularly in the Maritimes, Northwest Territories, Yukon and Quebec.

The development of cost-benefit and cost-effectiveness analysis, environmental and social impact assessment and a range of policy tools reflects an increasing concern and complexity in the regulation, direction and control of science, technology and society. Science and technology are not only seen as the problem, but, as discussed earlier, are, in the same tradition, seen as the solution.

The pluralistic nature of Canadian society has also contributed to the growth of the policy sciences and ultimately to SIA in Canada, as decision makers search for ways to accommodate diverse values and

regional differences. However, the major stimulus for SIA originated in the United States in response to an increasing recognition during the 1960's of environmental problems. In 1969 the National Environmental Policy Act (NEPA) was passed and directed the U.S. Army Corps of Engineers specifically, as well as all federal departments, "to create and maintain conditions under which man and nature can exist in harmony and employ a systematic interdisciplinary approach, insuring the integrated use of the natural and social sciences".¹⁶ Taken together with the rest of the Act and the need to demonstrate social as well as environmental implications prior to project approval, the setting for the development of SIA was complete.

THE DEVELOPMENT OF SOCIAL IMPACT ASSESSMENT

Interest in the prediction of social consequences has subsequently spread to much of the industrial world, notably to Japan, where major efforts are currently under way to reformulate GNP to a new indicator, Net National Welfare (N.N.W.) which deducts from the GNP, the social costs of maintaining or achieving any particular level of economic output.¹⁷ Social costing is therefore relevant to the development of SIA.

Following the creation of the NEPA legislation, consultants discovered a new and lucrative field. The result in both the United States and Canada has been a proliferation of expensive seminars and workshops intended to familiarize the private sector with this new phenomenon, and a scramble by engineering and environmental consulting firms to get into the market. The results have been the creation of some poor quality assessments, sometimes done by engineers, archeologists, biologists, and others without appropriate training.¹⁸ There is understandably, considerable pressure to fit SIA within the 'corporate context' and consequently to align it with an existing proliferation of policy tools. This may be a lucrative direction for consultants in the field, but could ultimately result in the demise of an approach which has some promise of addressing real and mounting social and environmental problems. In 1975, a study conducted for the Ministry of State for Urban Affairs identified only 24 SIA's that had been conducted in Canada.¹⁹ The number of studies, and amount of interest in SIA, has mushroomed in the years since this 'state of the art review'.

No Federal legislative equivalent to the NEPA legislation currently exists in this country although the Federal Government has moved in a similar direction with the creation of the Federal Environmental Assessment Review Process (EARP). However, its capacity to handle social impact is highly questionable. The EARP process is nested within Environment Canada and its major concern appears to be with the physical environment, the expertise of the majority of its panel members being in engineering and the physical sciences.

There are numerous sources of criticism of this process. However, I refer here to several situations in the Maritimes where the EARP process has been applied. Norman Dale and Sheryl Kennedy have reviewed the EARP

process as applied to a nuclear facility proposed for Point Lepreau New Brunswick, and a hydroelectric development at Wreck Cove, Cape Breton Island.²⁰ These two situations highlight some of the concerns already raised. The EARP process was apparently, in the case of the proposed Point Lepreau nuclear plant, unable to handle macro SIA-related issues, bypassing issues perhaps relevant to guaranteeing that present and specific actions do not become future and social liabilities. The review appears to have been trapped within a narrow context and functional only at the necessary but insufficient 'micro' level. The issue of foreclosing or of restricting future and alternative policy options was also apparently overlooked.

One can hardly image a less socially relevant EIA than one concerning nuclear power that fails to do more than mention safety, sabotage, waste-product handling - all issues familiar to anyone who hears or reads the news. Another specific issue is the financial effects of Lepreau development. Again, there was no effort to foresee the impact on other public expenditures, including social and environmental programs, of such a project. Ironically, the strain Lepreau has put on the provincial debt capacity, may now be standing in the way of New Brunswick's involvement in an even grander energy project, Fundy tidal power.²¹

In Ontario, environmental impact legislation, like the Federal Environmental Assessment Review Process, is primarily oriented toward the physical environment but includes affects upon human well-being. The interest in SIA in the private sector is growing rapidly. Interestingly enough, in the Calgary based oil industry, it appears to be Petro Canada which is leading the way in exploring the relevance of SIA to corporate planning. The Alberta Oil Sands Environmental Research Program (AOSERP) has included in its mandate a concern for 'human systems' and social impact.²² Alberta Environment is currently considering an examination of the social costs of industrial development and the relationship of social cost considerations to its mandate.

It appears that 'environmentalism' as it was known in the late 1960's and early 70's has been replaced by economic concerns. However, it can be argued that this in turn has revealed more fundamental questions and that environmentalism, as well as a concern for the 'econocentric' focus on Western governments, is being rearticulated toward a concern for human and societal goals and values.

THE RELATIONSHIP OF SIA TO OTHER FIELDS IN THE HUMANITIES AND SOCIAL SCIENCES

It becomes apparent that SIA and its dominant research traditions

are relevant to social history, political philosophy, the development of economics, and a split in the economic and social realms; a split which is perhaps best characterized by our attempts to balance 'collectivism' in social policy and programming with 'economic individualism'. Recent defeats of liberal governments in the democratic world may serve as comment on the difficulty of this 'balancing act'.

SIA, as a field, has strong roots in the social indicators movement and develops at a time when the social indicators movement encounters major philosophical and logical problems, with resultant doubt as to its utility. In a summary of a significant conference on social indicators, Roxann A. Van Dusen notes that problems with the descriptive, normative, and explanatory shortcomings of the social indicators movement threw major doubt upon their role in policy formation.

The same tangle of issues emerged in the discussion of the provocative data on job satisfaction. Sylvia Ostry questioned the policy relevance of such data, in view of the paucity of policy instruments that can be employed to influence satisfaction directly. Albert D. Biderman questioned policy relevance, in Ostry's sense as the exclusive criterion. In his view, perhaps the major purpose of social indicators is to affect the general image of society and the fund of knowledge about social change intelligent people have. If the thousands of actors whose work and interactions aggregate to "social policy" know "what society is all about", and if the publics to whom they relate share these understandings of what is important and why it is important, policy will improve.²³

The tremendous assumptions iterated by this last statement throw doubt on even this 'passive' role for social indicators. SIA attempts to address, in part, issues about the implications and use of social indicators.

With strong roots in the social indicators movement, SIA often depends significantly on the principals and methods employed in the collection and organization of social indicators. At the same time, there is a more 'reactionary' sense, in which SIA may be regarded as a response to the apparent trend in the social indicators movement toward what has been described as 'social management'²⁴ by a bureaucratic and technocratic elite, heavily dependent upon a purely statistical orientation toward social indicators. In a comprehensive and concise paper on the social indicators movement, Bertram Gross and Jeffrey Straussman²⁵ note the early 'humanist' posture of the social indicators movement and its attempts to dethrone econocentrism (as typified by the

PHASES IN THE ASSESSMENT OF SOCIAL IMPACTS

The commonly accepted phases in the conduct of social impact assessment include profiling, projecting, assessment, evaluation, and sometimes mitigation and decision making.²⁸ Profiling is undertaken to describe the existing situation and necessitates the compilation of baseline information. Methods employed in this phase include various types of surveys, the use of census data, descriptive information and interviewing. Some measure of public preferences and priorities with respect to areas of concern or focus is then attempted. Projection involves the prediction of actual effects of policies or plans. It is characterized by the use of analogy, Delphi techniques, extrapolation of trends, scenario writing and model and systems construction. Assessment refers to the identification and compilation of information on the magnitude and significance of probable outcomes. Techniques in the assessment phase are perhaps most in need of development and include analogy, cost analysis and survey techniques. Evaluation is conducted to determine the effects upon the community, region or nation. While the method of public participation is readily accepted as the major tool for achieving evaluation of the projected outcomes determined by assessment and their magnitudes, it remains the center of considerable controversy. It is maintained that public participation is essential to evaluating the effects of a project or policy. Effects must be compared to information compiled during the profiling phase and evaluated by a 'community' to ascertain the extent to which possible outcomes 'fit' with community values and preferences. There are serious problems with this aspect of SIA. It makes questionable assumptions about the nature, roots and significance of 'values and preferences' or at best accepts the assumptions and proceeds to use questionable preferences as a basis for planning. Mitigation and the resolution of associated issues may be elements of SIA where a project or policy is approved, but need not be included where SIA is conducted from the outset and where it is accepted that SIA can lead to the rejection of any proposed action.

The phases of SIA outlined above may be criticized for appearing too systematic, linear, and straightforward. However, their portrayal in this manner lends an air of certitude to the practice of SIA, illusory but essential to capturing public and private funds and recognition by necessary authorities.

The sequential manner in which (the phases of SIA) are presented and their failure to include the dissemination of information as an essential component raises questions about the use of these steps as guides to conducting the assessment of social impacts north of 60°.The dissection of SIA into these steps however, implies a somewhat rigorous and mechanical progression and hence their description as "phases" in the process of assessing social impacts.....Furthermore,

development and implimentation of planning, programming and budgeting systems (PPBS)) in American policy sciences. They also note the drift toward 'managerialism' as a focus of the social indicators movement. Social impact assessment implicitly may be regarded as a backlash against this 'managerial' use of social indicators and ultimately against elitist decision making. However, there is some danger that this focus may be merely the SIA equivalent of the earlier 'humanist' trend in the social indicators movement described by Bertram and Straussman.²⁶ The attempt to incorporate much of the information contained in social indicators with citizen participation and projective techniques in order to comment on *future* and systemic implications of human action, is perhaps indicative of this trend. While the social indicators movement serves primarily an evaluative function with respect to social goals and objectives, SIA attempts to *predict* the implications of moving toward certain goals and of taking certain courses of action. The relationship of SIA to a multide of fields is apparent from Figure 2.²⁷

FIGURE 2. FIELDS OF RESEARCH RELEVANT TO SIA, AND AREAS OF APPLICATION²⁷

| | |
|---------------------------|--------------------------|
| Social Profiling | Projection Techniques |
| Archival Research | Social Forecasting |
| Social Indicators | Trend-Impact Analysis |
| Observational Methods | Cross-Impact Analysis |
| Interaction Analysis | Sensitivity Analysis |
| Model Building | Multivariate Analysis |
| Demographic Analysis | Social Graphics |
| Institutional Analysis | Public Participation |
| Input-Output Analysis | Heuristic Approaches |
| Matrix Methodologies | Evaluation Research |
| Ethnographic Methods | Risk Analysis |
| Computer Methods | Impact Monitoring |
| Remote-Sensing Techniques | Psychological Assessment |

Developments in these areas must be deployed to the substantive topics of SIA interest, such as:

Housing and Urban Renewal
 Energy Development
 Highway and Mass Transportation
 Facility Siting
 Community Development and Land Use
 Coastal Zone Management
 Community Cohesion
 Population Displacement and Relocation
 Rural Development
 Weather Modification
 Health and Community Services
 Water Resources Planning and Management
 Boom Towns
 Architecture and Buildings

*there is no beginning or end to the process in real life; re-evaluation of the information attributable to each phase constantly occurs.*²⁹

The topic of social impact assessment has been the subject of several conferences and gatherings in North America in recent years, particularly the First Canadian Symposium on Social Impact Assessment held at Banff, Alberta, November 31, December 1 and 2, 1978, and in association with the Environmental Design Research Association's 10th Annual Meeting held in Buffalo, June 4, and 5, 1979. In what follows, I have attempted a synthesis of seemingly scattered methodological and philosophical problems, and a consideration of SIA within the topic of science, technology and human values in an attempt to identify a 'cornerstone' upon which current as well as future developments in the field might impinge.

SIA: THE PROBLEM AND IMPLICATIONS OF COPING WITH "CONTEXT"

Social impact assessment currently suffers from all of the weaknesses and problems associated with the many methods it employs in attempting to delineate and evaluate the future consequences of human action. It may be fair to say that as analytical capabilities improve, as new computer technology and capacity is developed, as longitudinal social indicators are compiled, and as better systems models are developed, we will witness progress in the conduct of SIA and in the reliability and utility of its results. The current attempts to develop better models and to discover the dynamics of impacts by moving away from mere check-lists is indicative of a general attempt to improve the technology of SIA.³⁰ Developments in this direction may be associated with the 'let's do better that which we already do' approach, discussed earlier. Systems approaches, as noted by Keeble³¹, merely extend the rational, scientific, technical world view previously outlined. In making this point Keeble cites Boguslaws' classic, *The New Utopians*; noting that not unlike the origins of modern science, systems approaches call for:

*an insistence upon a uniformity of perspective, a standardization of language and a consensus of values that is characteristic of highly authoritarian social structures. Nonconforming perspectives, language and values can be and, indeed, must be excluded as systems elements.*³²

He goes on to note that systems analysis is therefore founded on the same bias and "investigative ambiguities which have existed throughout the rise of modern science".³³ If it is true, as is argued in what follows, that 'context' is the major current element of importance facing the development of social impact assessment, the systemic implications of dwelling upon the technology of SIA, particularly the current 'ground swell' in researching systems approaches, are ominous indeed for the future role of SIA in decision making. The matter of 'context'

is therefore worth considerable attention. To overlook 'context' and to deal with the 'hardware' of SIA is to, by default, overlook fundamental assumptions and to commit oneself to the 'current and general direction of the ship' described earlier.

I would suggest, however, that the issue of context is central to any discussion of science, technology, and human values, and of priorities for dealing with the interrelationship among them. I have suggested that SIA is characterized by phases which most importantly attempt to incorporate human values into the projection, assessment, and evaluation of the future, and conceivably with motives similar to attempts to develop a more humanitarian focus for planning and policy by using human values and ethnographic research to interpret social indicators. There are, as is well known, major methodological and technical problems associated with the incorporation of human values into planning processes. Apart from the logical problem of basing a future on present day values, and the questionable assumptions and outcomes implied, the dilemma is that we are products of a profound and at times, seemingly entrenched 'way of understanding'. Our 'ways of making sense' consequently do much to guarantee that the future will be an incremental variation of the past. Is it conceivable that in the near future, policy decisions will be required which cannot come about incrementally? What are the implications for democracy, authoritarianism, participation, and human values? Our ways of making sense involve profound *assumptions* about the human condition which in themselves require serious re-examination, but upon which most of our policy formulation is ultimately based. These assumptions are rooted in Judeo-Christian traditions³⁴, and can be traced back to Newtonian physics, the "mechanization of man"³⁵, and the profound assumptions of Adam Smith.

*What we have is a society that places emphasis on control and exploration of all nature including, of course, human beings. How did this way of making sense replace feudalism some 300 years ago? What was this new image of Human nature and where did it come from?.....Mankind became perceived as machine-like rather than a cause for philosophical reflection.*³⁶

The authors of this quotation trace the systemic implications of this basic world view through the creation of a contractual society, the growth of liberal utilitarianism, the domination of the "market", the belief in the 'natural' forces of supply and demand, the development of possessive individualism, the modification of the role of government by Keynes, and finally, the transfer of the physical 'world view' to society and social relations in what has become known as the positivist tradition of the social sciences.³⁷ This is the tradition which currently characterizes the 'policy sciences', and appears to characterize the objectivity with which some practitioners would like to treat SIA.

Reductionism is the net result of placing social phenomenon (for purposes of analysis) within this scientific framework. Political scientist Floyd Matson describes the progression already outlined to the point where, at the end of the nineteenth century, "the dominant impulse seemed to be to force the objects of human inquiry and concern beneath the microscope of mechanistic analysis, to reduce their content to the smallest measurable denominator or the single irreducible cause - without, at the same time, contaminating the observation with "subjective accepted definitions of SIA.

The context of our times as well as dominant and inherited notions of what constitutes sound methodology are reflected in the more micro-level problems of incorporating human values into the assessment process. Planning the future on the basis of current sets of human values involves assumptions not unlike those of Adam Smith. Values are seen as naturally occurring, as being subject to natural pressures and developing according to some natural scheme, in the same manner in which unfettered supply and demand regulates the flow of goods in a capitalist economy. This denies the possibility that "the system" creates the values and maintains that our current state is a function of naturally evolving human values. There is here, as in any 'chicken and egg' situation, ample room for debate. This perhaps leads to planning, using current human values, the very future we may wish to avoid; a future characterized by what Gail Stewart describes as "the terrible technological imperative of growth at any cost -- more things, more things, more things".³⁹

Should SIA assess the future on the basis of human *values* or human *needs*? The tendency is often to assume that these are one and the same. However, given the impact that meeting human *values* has upon basic human needs, particularly clean air, fresh water and unpolluted landscape, the difference between needs and values and their relationship to each other merits closer examination. It must be emphasized here that while a relationship exists between values and needs, the difference between values and needs merits some consideration, particularly in the presence of scarce resources. To date, little attention has been given to the involvement of the public in an examination of needs in relation to human values and the assessment of probable project impacts. The emphasis in the development of citizen participation and in questionnaire research has been upon values. In this sense, the argument may be advanced that citizen participation as often practiced, and orientated toward current human values is a planning and policy liability, particularly where there is reason to believe that the relevant values are the products of persuasion, indoctrination, coercion or saturation, all of which serve the interests of dominant and narrow ideologies with vested interests in predetermined outcomes. I note with some trepidation that this probably includes anyone who glues themselves to a television set, night after night. There is I believe, relatively little difficulty in making the case that among us, there are vast numbers who are the victims of social values which serve the interests of ideologies, the merits of which we cannot afford to assume.

This failure to consider the context of current human values is common in the conduct of survey research and in examining the role of public participation in the planning process. One of the best examples of the dilemma is presented by the development of nuclear power. Using citizen preferences and values has, in the past, resulted in planning which reflected an early lack of knowledge and problems the public experienced in understanding nuclear technology. It is also interesting to note that reasons given for supporting nuclear power plants have reflected, and presumably would still reflect, the dominant ideology exemplified by "more things, more things, more things". In 1977 research on citizen attitudes toward nuclear plant construction in one American town reportedly demonstrated project support and cited "economic growth, more jobs, increased local business, more money, cheaper power and more industry"⁴⁰, as the dominant reasons given by local residents for support. The context of our times is a powerful master indeed. This same study is oblivious to the contextual problems associated with the research conducted.

In a key paper prepared for the First Canadian Symposium on Social Impact Assessment, Doug Torgerson dealt substantially with the problem of 'contextuality', using the Berger Enquiry and nuclear power as illustrations. Although he does not relate the problem to citizen participation in the manner in which I have, he reinforces, particularly with respect to nuclear power, the observations I have made.

*A summary of the conclusions reports this key finding: "Most residents would permit construction of the nuclear facilities again because of real economic benefits and the lack of any perceived disbenefits". Assuming the accuracy of this finding, what is its significance? I submit that we can begin to answer this question only after we have considered the context in which this attitude is informed.*⁴¹

The case for ethnographic research is quite clear. But what of citizen participation? I have seemingly taken a stand against citizen participation on the basis that human values currently cannot assess potential impacts and do much to carry the present into the future. But surely such a position is highly elitist.

It may be concluded that in Canada, as elsewhere, more research and attention should be devoted to human needs as distinct from human values. Citizen participation should perhaps be re-examined with a focus on the identification of present and future needs, as opposed to the attempt to inject current human values into the planning process. Even in this 'land of plenty' there is a critical and identified difference between human needs and human values as reports on the elderly, native Canadians, youth, single parent families, and the inner city will

confirm. Those of us who do not sit 'on the front line' every day, readily and soon forget that regional and personal disparities are a real Canadian problem, unsolved by 'right of centre' free enterprise or by liberal social programming. However, those of us who have worked in the more affluent suburbs of Canada, as well as the inner city and more remote regions, note with alarm the unmet psychological needs for attention, appreciation, consideration, understanding and love that are epidemic to the middle class teenagers of this country. At all levels, pursuit of current values is having profoundly negative impacts upon human needs.

SOCIAL IMPACT ASSESSMENT AND HUMAN NEEDS

A number of years ago I had the pleasure of participating, with sixteen other individuals from diverse backgrounds, in a unique attempt to deal with the planning and management of communities on the Canadian resource frontier. The end result of this exercise represents I believe, one of the few examples in this country of an attempt to structure the physical and management form of a community around the concept of human aspirations, re-examined in terms of human needs, and set against a willingness to question expensive technological solutions to coping with the Canadian environment.

The following explains in part the design exercise we undertook. It provides some example of the problem, in this particular case, of 'coping with the context of our time'.

We were caught in a market research mentality that was based on the probability that groups of consumers, with described characteristics, would likely prefer one kind of product rather than another. We were preparing ourselves to design a community based on social science research knowledge of the choices that Southern Canadians made while living in a Southern climate with four seasons, year round night and day, and no black flies. We were doing so even in the face of our knowledge that in our urban communities crime rates are rising, stress diseases are reaching epidemic proportions, and family life is disintegrating.

We began to recognize that perhaps any system that is built on asking people what they want is a system that, at best, can only deal with improving on past experience. For example, when we ask people what they want in their new house they will tell us: a fireplace, a bigger kitchen, a family room. We forget to ask them the more fundamental question. Why do you want a house? Habit? Status? No experience with any decent

alternative: The only kind of neighbourhood, with children, and playgrounds, and decent schooling? Of course, we want a house because that is the life style we have adopted in this country. But how well does a house meet our human aspirations?

With these kinds of questions in mind we tried to unblock ourselves from our prior assumptions; to stand back from our current patterns and attempt to look at the problem with fresh eyes. We engaged ourselves in hours of argument and debate that slowly and painfully led to what we believe is a better way to begin the design process.

We took the social science research alternatives and looked for consistencies in human behaviour that did not appear to be culture bound. We visited frontier communities and talked at length with residents about their lives. We looked at the people in Canadian cities and the problems they face and the things they indicate they would like to see changed. We reviewed much of the research on "work", including some of the more innovative experiments that seem to be producing increased worker satisfaction as well as productivity.⁴²

In commenting upon possible goals for the development of SIA, it cannot be denied that there are specific techniques, technologies and research results which will fine tune efforts to improve SIA and which will make the path of our ship more efficient and effective in heading for the horizon. However, if we accept that there is any possibility that a new direction is likely to be needed, I am not convinced that 'doing better than which we already do' will meet our needs. My conviction is that the problem of importance for SIA is one of context, but that, in fact, it is *the* problem of science, technology and human values.

Coping with contextuality might involve the following:

- o the redirecting of our communication efforts toward an appreciation of our cultural 'roots', the history of our ideas, and the context within which we live,
- o the reorientation of public participation away from its current narcissistic focus to a re-examination of human needs and the needs of others,

- o the conduct of more holistic research on the nature of the needs of Canadians relative to current and future Canadian geographical and economic factors,
- o the integration of history, philosophy, political science, and interpretations of historical developments with technical training and education in the physical and engineering sciences,
- o an extensive examination of the social costs of industrial growth in Canada and its systemic and long-term implications,
- o the funding of research and support for attempts to develop a new indicator of national well-being. Without this basic information we cannot even evaluate current directions in Canadian society nor are we likely to question the 'context of our times'.

As paradoxical as it may seem, social impact assessment and impact assessors need to focus considerably more time on the past, in order to deal with the problem of contextuality. We cannot meaningfully evaluate the future social implications of current human action unless we better appreciate dominant *assumptions* about what it means to be human, and as a result of this new found freedom, examine alternatives which allow for the realization and evaluation of futures with meaning beyond the limited and troublesome 'context of our times'.

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Some Comments on Brusegard, "Social Indicators and Public Policy"
and Michalos, "Working Paper on Satisfaction and Happiness"

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Fundamental to the social indicators movement has been its concern with dynamic social processes, a reaction to the static bias of the social sciences over the past several decades. Dominated as it was by structural-functionalist theory, sociology in particular lost sight of the fundamental importance of social change. However, sociologists instrumental in sponsoring the social indicators movement in the U.S., such as Otis Dudley Duncan, Eleanor Sheldon, and Albert Reiss, share an interest in the development of dynamic theories of society and view the collection of useful time-series data as an indispensable first step in the achievement of this goal and in the ultimate development of social indicators useful to policy makers. As Stone puts it in his proposal for a system of social indicators, "It will be necessary to go through an analytical stage, leading to an understanding of the relevant social processes, before the indicators needed can be specified in detail" (United Nations, 1975:27).

An informative analogy is the relative usefulness of economic indicators before the development of the macroeconomic theories of Keynes. Though economic indicators had been collected in the U.S. since the 1920s, they were not useful as tools to predict the outcomes of economic policies until the development of sophisticated econometric models based on Keynesian theory. The lesson for social indicators development should be obvious. As suggested in a funding proposal to the U.S. National Science Foundation by the Social Science Research Council's Center for the Coordination of Research on Social Indicators, the immediate priority of social indicators research ought to be the procurement and dissemination to scholars of a longitudinal data base which is usable in testing theories of social change at both the macrosocietal level and at lower levels of organization. In view of these considerations, Brusegard's naive enthusiasm for the immediate usefulness of social indicators to policy makers is certainly misplaced.

The major problem with Brusegard's proposal, however, is related to the concept of 'well-being'. His emphasis on the measurement of the well-being of the individual is shared by just one of the many proposed systems of social indicators, that of the Social Indicators Programme of the Organization for Economic Cooperation and Development (OECD, 1976) so heavily quoted by Brusegard. He does not seem to recognize that many other schemes with diverse priorities and points of view exist, such as the System of Social and Demographic Statistics developed by Stone (United Nations, 1975), Allerdt's (1973)

"Welfare Model of National Development," and many others. Michalos's paper compounds the confusion by implying that what social indicators research is all about is subjective perceptions of well-being, happiness, or satisfaction. Actually, such problems represent only a minor corner of the area of social indicators, and one of questionable utility at that. As Michalos himself points out (p. 2), there is no evidence whatsoever that these subjective states vary systematically either across societies at different levels of development or over time in a single society with material level of living or any other characteristics of the social structure. While these subjective states might be of some theoretical interest to social psychologists, it would be difficult to convince policy makers that they have any immediate relevance to their concerns.

A systematic review of the entire scope of research activities related to social indicators would reveal quite a different picture from that represented by Brusegard's paper (see Rossi and Gilmartin [1980] for such an overview). Most social indicators work has dealt with structural features of societies and their change over time: trends in labor force composition, industrial structure, social mobility, population processes (i.e. mortality, fertility, and migration), scientific research and development, crime rates, the distributions of income and wealth, education and many others. It might not be difficult to convince a policy maker that a knowledge of trends in the occupational composition of the labor force and population growth and distribution would be relevant to decisions about the future funding of higher education. But does it matter to him or her if some people are more satisfied in general because they are happier that they spent four years in university? How does that advance our understanding of the dynamics of industrial societies or assist their administration? If SSHRC is to fund research on social indicators, it would be well advised to seek advice from scholars aware of developments in the field as a whole and conversant with the social scientific use and implications of the collection and analysis of such data. In particular, a social indicators effort divorced from any theoretical context is destined for the sterility of any other fact-finding exercise. Without theoretically-grounded, empirically tested models of the causal linkages among indicators, any effort to use them to inform policy decisions or plan programs will inevitably fail.

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SELECTED WRITTEN COMMENTS

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Seven draft papers for the Human Context for Science and Technology Symposium were reviewed. Two contributed little, if anything, to the understanding of roles of the sciences (understood to include both natural and social) and technology in society (Jackson, Guedon). Brusegarde's discussion of social indicators could be used as an example of how dangerous data gathering for its own sake may be. Bindon on science, technology and social studies, Demirdache and Carpenter on technology assessment, and Tester on social impact assessment are useful pieces with which to start to build an understanding of science, technology and society.

If the sciences and technology are to solve more problems than they create, their roles in society certainly need more consideration.

That the sciences and technology have important positive and negative influences on society is undeniable. However, although it has been almost "studied to death" (Commission on Canadian Studies, 1978; Doern, 1972), Canada still ranks with Greece and Turkey in terms of financial support for the science community. At the same time Canada has, or hopes to embark on some very large and/or sophisticated scientific and technological endeavours which will have very serious ramifications for society.

Although it has been studied very extensively, the strengths and weaknesses and roles for the social and natural sciences and technology are little understood in Canada. This is part the cause and part the result of Canada's having one of the weakest science advisory systems of all of the developed countries. This may be a legacy of an early church-and-state-like separation established between the National Research Council and the Canadian federal government and copied by the provincial governments.

The weakest papers were contributed by authors whose vision and views were severely limited by the mists of Coma City. It is distressing that current and former prominent civil servants have contributed so little of significance to the discussion about the relationships between science and society.

There is a large group of highly paid, isolated, intelligent people who have unfortunately been trained to wait until momentum on issues develops outside the Nation's Capital before they can start to redefine the issues. Even more unfortunate is the tendency to spend more time redefining the issues and problems and making very general statements about desirable philosophies, but very little time and thought on the detailed and specific policies and programmes that will actually start to get us to what they have finally recognized as a desirable goal.

Ray Jackson's paper, "The Conserver Society Discussion: Implications for Research", did not seem to be particularly illuminating because, although it did outline the problems, the possible solutions and the "implications

for research" were too generally or vaguely stated to be useful. The "conserv society" concept was not put forward as another set of descriptions of already defined problems but as an attempt to get the discussion off the limits and onto the possible solutions. Further, there are some other problems with the text. For example, the cause and effect relationships of the social limits to the problems identified are not at all clear: 13% of Canada's surface is useable for agriculture (including grazing), but only 7% is arable (fit for plowing); energy and material recovery from the solid waste plant mentioned will never function well in a conserver society because the design flies in the face of entropy and good sense (take some valuable resources (waste), mix them thoroughly, move them somewhere else and then try to separate them again).

Part of one sentence of Jean-Claude Guedon's "Science, Technology and Human Values: A Counter Proposal" raises a very pertinent question: "How can we make sure that the benefits accruing from scientific and technical activities are distributed in a more equitable way than is the case at present?" Beyond that the paper is neither informative nor illuminating. It would be interesting to know where the author obtained the caricature of "mad scientists" upon which he bases his entire thesis: all scientists are obviously inhuman, they are all a new brand of "sorcerer", they all use scientific tricks. Any scientist would be foolish to try to discuss any issue with an individual holding such views of science, let alone provide them with information (obviously any information provided would necessarily be incorrect - a trick designed to retain the power of exclusive knowledge). There would be no scientist one could trust to evaluate it and so the information could not be used.

The extent to which this paper tries to increase the isolation postulated in Snow's (1959) two solitudes clearly makes it a step in the wrong direction. Guedon's attitude toward scientists is very heavily prejudiced, suggesting that scientists should adopt a defensive role, and will necessarily make it more difficult to provide a good answer to his question.

David Brusegard's "Social Indicators and Public Policy", may be a useful paper. However, six very fundamental problems have been left unmentioned.

1) There is a little ambiguity about whether or not social indicators are strictly statistical (quantitative) or are also qualitative.

2) In defining social indicators, Brusegarde suggested that only indicators which are national in scale reflect "societal" aspects. This reflects a federal bureaucratic view, rather than reality, because if nothing else, the federal abstraction covers many societies within the Canadian mosaic. This definition may also suggest that other levels of government would have limited use for indicators.

3) The argument that social indicators are a useful tool of social policy is not made convincingly. If nothing else, they produce a system that reacts to problems rather than anticipates them.

4) There is a very good possibility that the use of social indicators would become tools used directly or indirectly for cultural homogenization and to force conformity. Part of this may stem from the overwhelming influence of American literature on the subject because the American "melting pot/Americanization"

approach to culture does tend to promote homogenization. If, however, Canadians do subscribe to a mosaic or multicultural approach, then the tendency to homogenization must be resisted. When "indexing welfare elements" or "modelling systems", can the approaches handle several different cultural systems? Can it accommodate those who desire not to conform to a middle class, consumption-oriented culture which is homogenous throughout North America? These requirements for accommodation of more than one cultural system would make the application of social indicators to policy making very much more difficult, if not impossible.

5) There is another problem in that social indicators may tend to reinforce the status quo and make change in any social system or social values more difficult than it already is. Consider the excuses: that policy cannot be developed or followed because we do not have indicators for it; or the existing indicators indicate that such a change would be undesirable (self-fulfilling prophecy).

6) Given the tables included in the paper, not only could the gathering of data for social indicators become a national waste of time, they would be a dangerous invasion of privacy. Given the deplorable record of confidentiality and anonymity of Statistics Canada, social indicators might simply provide another source of information for the RCMP, employers, credit rating institutions, etc. Note that there are a large number of questions that can easily be construed to be an invasion of privacy and some of which would clearly be of interest to agencies interested in investigating and influencing the private lives of Canadians: birth control information, satisfaction with career, political orientation, political trust, religious orientation, attitudes toward and satisfaction with judicial system, etc. Certainly, the federal bureaucrats are going to deny any intent at invasion of privacy, that the process would be time consuming for individuals (the interviewer is paid, the interviewee is not, but who wants the information and who's got it?) or that the RCMP or anyone else would have access to individual information. Before any further development of "social indicators" is permitted these issues must be aired and settled.

"Technology Assessment - The Process - A Canadian Perspective", by A.R. Demirdache, is a reasonable overview of the literature available on technology assessment, largely dominated by ideas from the U.S.A. It has not placed sufficient emphasis on the most important distinction between the two principal characteristics of technology assessment - does the process lead to a recommendation or a decision. No matter how complete, interdisciplinary, well-funded, all encompassing and thorough a technology assessment is, if it leads to recommendations which can be ignored with impunity (such as many in Canada are) it is not certain whether attempting a technology assessment is just largely a waste of money, a complete waste of money, or worse, an exercise in deception.

There have been several exercises in technology assessment in Canada which meet most of the criteria set out in the paper. They are characterised by being: (1) part of a process leading to a decision; (2) involving several processes not generally recognized as technology assessment methodologies but nonetheless, in combination, doing just what technology assessment is supposed to do; (3) involving at least part of the time, the cross-examination of expert witnesses brought forward as, or by, the proponents and opponents of a particular technology. The examples of this best known would be the Berger and National Energy Board hearings on the MacKenzie Valley Pipeline and the hearings by the Alberta Energy Resources Conservation Board into Imperial Oil's heavy oil project for Cold Lake (Elder, 1980 ; Simon, 1980). Clearly, it is easy to identify shortcomings in both of these sets

of processes, nonetheless, they should be recognized as real world (not Academic) exercises at technology assessment and should be studied as such.

Although the international perspective cannot be ignored, the general impact of the international perspective on technology assessment is definitely undesirable. Technology assessment must be site and culture specific, where it is not it cannot possibly give good results because of misfits with climate, resource base, value systems, etc. The site and culture specific demands of technology assessment should also influence methodologies.

George H. Bindon's "Science, Technology and Society Studies: Difficulties in the Development of the Field and Some Problems Particular to Canada", is a useful paper which could have been clarified by identifying many of the problems of doing science, technology and society work as those common to most, if not all, interdisciplinary efforts. In the last few years much has been learned about how to deal with these problems in areas such as environmental impact assessment, modelling, resource management. Reference to the literature on solving interdisciplinary difficulties would be useful here.

It should be noted that the USA may not be a good model for Canadian science, technology and society studies because: (a) there is some question about how successful the USA programmes are; (b) the USA is not yet a branch plant economy; and (c) the scale and the scope of the American problem and programmes is much too large.

The discussion of science and technology in the Symons Report "To Know Ourselves" is pertinent here.

The proposed Association for the Advancement of Science and the resuscitation, reinforcement and refinement of something like Science Forum, would seem to be essential. The Science Council's Agenda (Science Council of Canada, 1979) is a commendable effort but much too limited. Until scientists start communicating effectively with the public, the support for and the utilization of science must be smaller and less effectual than it must be.

Stanley R. Carpenter's "Technology Assessment and Appropriate Technology", is a reasonable start on two very important topics. The questions posed at the beginning are good ones. However, there are several considerations which do not seem to appear in the remainder of the paper, but which would have very important bearing on the assessment of the answers presented by Carpenter.

The nature of "proof" and "evidence" in both scientific and legal worlds makes technology assessment very difficult. Technology assessment should try to predict adverse impacts and suggest either that the process be stopped, or not started, or that mitigative measures be adopted. Unfortunately, in both the scientific and legal worlds it is generally not possible to provide satisfactory "evidence" to "prove" that the whole process should be stopped or mitigative measures should be taken. This is because the "experiments" that would have to be done cannot really be contemplated. Nonetheless, the "evidence" and "proof" expected of technology assessment by some proponents of technology demand the impossible: how can you prove the consequences of exterminating a species except by exterminating it and demonstrating the consequences? Must we really experience a major nuclear disaster or oil spill in the Arctic to determine what precautions are reasonable? To take action against processes which might lead to species extinction (spread of DDT and PCB's), or the depletion of the ozone layer, or significant climatic changes (CO₂ greenhouse effect), do we really have to let them happen or can we use some judgement to anticipate and avoid problems, especially

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when the results of an action would be irreversible or only reversible over a very long time? It is interesting to note that in the courts there are few "anticipatory" laws. The possession of some drugs is illegal and carries heavy penalties because some segments of society think that the use to which the drugs might be put might be harmful. The possession of burglary tools is also illegal in anticipation of the use to which they might be put. Laws against driving while under the influence might also be characterized as anticipatory. With very careful preparation, it is possible to get temporary injunctions against certain actions in anticipation of damage.

Clearly, neither science nor law have an understanding of the nature of "evidence" and "proof" which would allow technology assessment to operate easily and effectively.

There are some difficulties with Carpenter's discussion of Appropriate Technology (AT). Although he touches on the issue, the predominant criteria of SCALE and SIMPLICITY when applied rigidly do not provide very good assessments of appropriateness except in very narrow cultural sense. Electronics, telecommunications, much of the availability of intellectual stimulation (music, publishing, newspapers and magazines) although admittedly abused, would disappear. Lovins' (Lovins, 1977, 1979) definitions are much more useful than Schumacher's (Schumacher, 1973).

Frank Tester's "Social Impact Assessment: Coping with the Context of Our Times", is a very useful paper which, with the appendices, provides a good summary statement. However, the following remarks deserve consideration.

Although the distinction between "fine tuning" and "fundamental change" is a very important one, one dilemma is that while working for fundamental change we may ignore some bush fires at our peril, but spending all our time bush fire fighting guarantees that we will never systematically get any fundamental change. Can we afford to do nothing about current problems while working for fundamental change, and how do we get fundamental changes in this society?

The fact that social impact assessment attempts to be predictive and preventive/mitigative makes it much more worthwhile than social indicators which are to be reactive.

There are many methods employed in social impact assessment. This is desirable especially while we are on the low end of the learning curve. In attempting predictions, where data on the future must necessarily be "soft" at best, the ability to use more than one technique and compare results will be very valuable. Therefore, selection of "the" methodology might not be desirable. Furthermore, different problems will probably demand different methods for social impact assessment.

A more critical review of the roles of public participation is perhaps in order. Experience on the ECA's Oldman River Water Management Panel (ECA, 1979) led to the conclusion that the following were some of the advantages of the public hearing process, especially when it permitted at least some questioning, though not cross-examination, of those appearing before the Panel.

- (a) Local people are in fact experts in many respects and new information and new problems were identified.

- (b) The process provided new ways of describing old problems or solutions which were of value in trying to obtain a fresh view on the issues. 280
- (c) The individual's skills of review and analysis of background material, and the development of abilities to present the results of that process will provide a community with a very valuable resource in the future.
- (d) Some of the more outrageous demands or claims were either moderated or put in perspective by the hearing process.
- (e) The process can provide an outside assessment of the advice provided to the Minister or the government by civil servants and consultants.
- (f) Contacts within and between communities were established which may persist long past the hearing process.

The review of Canadian history to identify serious social impacts from development projects or resource mismanagement (the perennial Canadian boom and bust phenomena), and to speculate about the mitigative measures that might have been taken, would be useful as would the post-construction evaluation of currently operating projects.

To Tester's list of fields of research might be added the following: perceptions of risks and the understanding of and education about probabilities; the incorporation of multicultural systems in social impact assessment and modelling exercises; the evaluation and integration of quantitative and qualitative techniques; discounting the future.

Articulation of the desirable roles for the sciences and technology has been poor to totally inadequate. Improvements in the understanding of the sciences and technology by society and more awareness on the part of scientists and technologists to the positive and negative, qualitative and quantitative impacts of their work are essential. Hopefully, a programme initiated through the Social Sciences and Humanities Research Council will produce something more than academic papers.

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A Comment by Greg MacLeod

March, 1980.

I must take strong issue with the general orientation and the hidden premises of this paper. In itself the paper is well done and the writer is a competent person. I do agree that public policy should have a rational foundation, but I disagree with the unargued supposition that "rational foundation" means a foundation of "social indicators". As a term "social indicators" implies the use of conventional empirical analysis in the style of Alex Michalos. There are tremendous complications involved here and the authors don't seem to be aware of them. The old view of social science is that the past explains the future in a systematic cause-effect relationship. Once the patterns have been discovered we can predict the consequents from the antecedents. However, it is commonly accepted by the man on the street that purposes and goals are relevant to the shaping of public policy. Since this involves a non-existent future causing the present, we have a problem in legitimizing the notion of purpose in terms of conventional cause and effect. Charles Taylor in his book, "Explanation of Behaviour", (New York Humanities Press - 1964) insists that "purpose" cannot be reduced to an antecedent cause as is often done by old-fashioned empiricists. He opts for a teleological form of explanation which is also empirical.

I consider that it is extremely dangerous when social scientists or any scientists consider that they should have a privileged influence upon public policy. I have resented for a long time the scientists at Dalhousie University who have been providing "rational foundations" to the government of Nova Scotia for a wide variety of policy questions. Things have come to such a pass that a demographer at Dalhousie could provide studies which served as a basis of a government decision not to build houses for poor people in New Waterford. Using conventional methods, the university group provided the government with a population projection indicating that the Cape Breton population would drop radically. On this basis the government cut back on housing plans and other kinds of planned services. The projection turned out to be incorrect. The population remained but the services had not been provided. The scientific answer was that the people did not follow the expected patterns. Yet the social economic life of the community has been effected by the government decision based upon "scientific" advice. In a highly technocratic and bureaucratic system, behavioural scientists can have a tremendous power leading to a new form of fascism. Simply because the power is benevolent does not make it less fascist. These are hard words but the issue is fundamental. I believe that the council must make great efforts to have the whole question of public policy debated among the wide intellectual and academic community.

Statistical surveys on antecedent patterns are not an adequate basis for government planning. Very often they allow important premises to go uncriticized.

There is a great danger of self-fulfilling prophecies unless a variety of approaches are used. An input to government must not be limited to sociological data much less to one school of sociological tradition. Other disciplines often have an important contribution to make. The classical humanities such as history and philosophy can shed a great deal of light upon contemporary social-economic problems. Indeed it would be foolhardy for a government department to determine a policy regarding Quebec without an analysis of the historical evolution of the problem as well as the different conceptual frameworks effecting basic definitions such as nation, people, state.

Gregory H. L. L.

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Review of S.L. Sutherland, "Studying Policy Outcomes for Government"

This paper opens with the provocative statements that social science has fallen into poor use (perhaps abuse), that the relevant problems associated with this fall are often "value" problems, and that there is a solution. It also offers to provide the much needed historical background to the current predicament of the social sciences (as the "handmaiden of society"). Critical analyses of the role of social science and the history of that role are two substantive tasks from which members of the social scientific professions -- and policymakers-- could only benefit.

However, as a historical overview, the paper suggests that social science has dwindled to just another occupational niche in the public service. The insightful comments about the persistent problems of "values" in this history lead to disappointing conclusions; it is suggested that we create just one more public institution, and that it would provide a new home for those orphaned 'objective and rigorous social scientists'. Or so the paper reads. (Actually, this proposed "sorting institution" bears a disturbing resemblance to the present-day Canadian university.)

Briefly stated, I think the paper retains three traditional -- and perhaps at this historical moment, questionable and negotiable -- assumptions.

- 1) that "facts" and "values" usually can be treated separately,
- 2) that a traditional notion of social science "expertise" is still valid and tenable, and "should be disentangled from bureaucratise wherever possible",
- 3) and that the use of social science in bureaucratic and political contexts is a recent development -- one with a short history -- and thus social science has only recently been transformed into a service industry.

Perhaps rather than operating with these assumptions, and designing a research funding program that seeks to legitimate or to extend them, these assumptions might provide the very subject matter for historical, empirical, analytical, and rational inquiries.

Review: David Braybrooke, "Issues in the Interaction between Ethical Principles, Political and Economic Philosophy and the Development of Public Policy"

The importance of this paper cannot be overstressed. In a concise and cogent manner, Braybrooke has demonstrated some essential issues that are all too easy to neglect when we operate with the fixed neural pathways of a scientific "mind".

Among its pertinent messages, three seem critical to the setting of priorities for research in science, technologies and human values:

- 1) that the subjects of critiques of preferences, needs, rights, and justice represent bodies of knowledge without the sufficient treatment they require,
- 2) that these subjects are interrelated and, indeed, suggest the meta-issues of doctrines and compromises,
- 3) and that while the author speaks from a philosophical perspective, the subjects have their correspondences in political scientific and everyday dialogues.

When the author closes with the comment about his "conception of philosophy as a sort of social science concerned with the use in language of concepts" (p. 7) he reminds us that philosophy is more than art. We should extend that comment and recognize that social science is not just technique. And if social science is used merely as such, its potential in the study of science, technologies and human values will be unfortunately underrated.

Review: Social Indicators Research

Several papers at the conference suggest the utility of the social indicators in the study of science, technologies and human values. These notations imply that social indicators' research should be taken as a scientific endeavour. However, it is also stated that social indicators provides a good technique, specifically for the measurement of satisfaction (read values?) and the change of perceptions of satisfaction (read control?).

A haunting problem of these papers is the assumptive bases upon which social indicators are designed and utilized. The study of social indicators makes certain assumptions about human nature and the methods of social scientific inquiry. Some of these assumptions are clearly stated. Others are not. For example, social indicators contain assumptions about "social wellbeing". That is, it is held that wellbeing is somehow related to material conditions, that it is a relatively stable characteristic, that it can be quantified and measured, that it is to some degree shared among groups of individuals, that reports of wellbeing correspond with experiences and perceptions of wellbeing. Of course, some assumptions are necessary for social science to happen. But, as history has shown, in the absence of critical assessment or self-reflection, social scientific assumptions can take on a social reality all of their own. We only have to look at social science notions of hedonism, the hereditary bases of intelligence, the "emotional" nature of women, meritocracy or "fitting a man for his job", the appropriate socialization of sex roles, the successful measurement of "creativity", the measurement of unique "racial qualities", the great utility of mental tests for determining the good soldier, immigrant, or student, and so on.

Perhaps the point of this review, or exercise, is obvious. There are fundamental problems associated with social indicators research. They might even be called dilemmas. Social indicators are treated as the basis for theories of psychological satisfaction and as a reliable technical tool for assessment. Is the field prepared for both? Social indicators are taken as an objective measure, but it is apparent that they are built upon a foundation of subjective assumptions. Is the field able to substantiate both?

Tester projects upon social impact assessment a desire for a fundamental social change, contrasting this with trivial "fine tuning" of the present system (how one can tell, except in retrospect, what is or is not a fundamental shift, is left to the imagination - the basic weakness of such convenient dichotomies). This causes him to reject the development of new knowledge along conventional lines and probably explains why he offers 26 pages of analysis but no clear research priorities. Had he been satisfied with a more modest role for SIA, a role for which it has much potential to reveal previously hidden social costs of "development" projects, Tester might have zeroed in on some subjects urgently in need of research. Examples: clarification of the concept of "social impact" (Tester is wrong in his assertion that "general agreement exists among practitioners as to the definition of SIA"); creation of some depth in the methods of identifying and evaluating such impacts (the list in Figure 2 illustrates the superficiality and facile labeling that now characterizes the field); attention to the key issue of individual and collective, especially governmental, responsibility for the impacts that are identified in SIA practice; a re-evaluation of the applicability of current public participation and consultation approaches to social impact assessments; a differentiation of project and environment types, especially to pinpoint those (as in many Northern resource exploration projects) where social, economic and environmental impacts are inextricably linked and therefore require a holistic and experiential treatment; examination of different approaches to the critical evaluation stage where issues of needs are particularly problematic; and consideration of alternatives to impact assessment (for example, environmental mediation as practised by Cormick et al at the University of Washington).

We suggest that it would be fruitful to direct research toward such questions. Practive in the SIA field in Canada undoubtedly will increase. But the sound theoretical and methodological base needed to address the basic questions SIA uncovers will not follow from practice alone. A role for the Council appears both valid and necessary here.

COMMENTS ON FRANK TESTER'S
 "SOCIAL IMPACT ASSESSMENT: COPING
 WITH THE CONTEXT OF OUR TIMES"

by

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Frank Tester's paper provides an overview of a particular type of social impact assessment and makes some good points about the limitations imposed by "context." In my view, however, his argument goes too far in its critique of current research methodologies and in its rejection of individual values as important inputs to decision making. In the latter case, the author correctly recognizes the philosophical quandry in which he has placed himself and does not successfully resolve that problem.

My remarks will be confined to three issues of which the last is clearly the most important.

- a. Should social impact assessment be considered a separate field with its own subject matter and methods? The author seems to suggest that it is, or should be, distinct and I would disagree. A close parallel exists between social and environmental impact assessment with the latter involving biologists, chemists, physicists, engineers and so on. It is the collective knowledge and experience of these disciplines which allows a determination of the likely effects of new developments. Yet Tester seems to present SIA as if it were a research area of its own, complete with unique methods. Hopefully such a view will not prevail and SIA will be taken as an invitation to economists, geographers, sociologists and others to apply their knowledge and methods simultaneously to problems of the social effects of technology and other changes. SIA is at the methodological and substantive intersections of several fields just as social indicators research is. Unique methods and research topics are not needed.
- b. Are quantitative research methods biased toward free market, natural order philosophies? Tester sides with those who argue that many social science methodologies including survey research are implicitly system supporting. This argument overlooks the fact that these research methods are used by Marxist sociologists in North America and Europe to critique the system and that they are employed extensively in socialist countries.

If his objection is to a reliance on survey research which includes superficial questions about values and preferences, the point is well taken. Social experimentation and comparative cross-cultural analysis produce valuable insights which are beyond the scope of survey research. If, however, his objection is to the use of quantitative methods and survey research because of their system support bias, he is mistaken and left in the position replacing them with highly subjective and contentious forms of evaluation.

- c. Can we believe what individuals tell us about their attitudes, values and preferences? This is the central issue in the paper and Tester opts for the position that most citizens are so entrapped (socialized) by the prevailing social values and life style ("context" in his terms) that they cannot see beyond the bars of their cages. He also seems to conclude that the value orientation which they endorse is based on economic growth and materialism. At no point is any evidence presented that Canadians are predominantly materialistic or that they are uniformly happy with their lots. In fact, some evidence does suggest that, by and large, we value social goals more than material goods. Further, although Canadians are generally satisfied with their lives, there are major differences in the degree of satisfaction within the population.

The view that citizens are not sufficiently competent to recognize an unsatisfactory situation ignores the wide scope of within population difference. It also fails to register the broad range of social behaviors which are motivated by dissatisfaction with the current situation. High rates of housing switches, job turnover, and divorce actions hardly indicate a population incapable of recognizing and registering dissatisfaction. Citizens may not be cognizant of all alternatives might provide rewarding futures but that limitation does not discredit surveys of the values and satisfactions of the population.

The author did place himself firmly in the camp of the "technocratic elitist tradition" and his preference for research on human needs rather than values did little to improve the situation. An attempt to define the concept of "need" and "value" would have helped along with some indication of how

human needs might be assessed. Presumably citizens are no better able to discuss their needs than their values so that the identification of human needs must pass to the intellectual elite, specifically philosophers and psychologists. While the "father knows best" position has its merits if one is among the decision makers, it is essentially non-democratic and cynical.

I do not wish to defend citizen participation as it is currently practiced but am of the opinion that the structure of public expression is at fault not the concept. When citizen response to social issues must be expressed in the form of presentations to a commission or some other official body, the immediate effect is to encourage that formation of interest groups which present their views in a competitive atmosphere in which rival groups vie with each other in attempting to impress the panel. In most cases the process does not represent the "public", only some select subsets of it, and does not encourage cooperation. Experimentation with other means of assessment of public sentiment and new formats for the expression and conciliation of differing views should be undertaken.

Paper by Brusegard

I have serious reservations about the whole exercise. The paper is mainly sound; but has some ill-founded optimism about usefulness in future.

The main purpose of social indicators will be as a kind of warning about weaknesses in policy approaches: not a satisfactory base to build policy on; has potential to point out negative features of proposals made (and failures of ones done).

The social indicators movement is too shaky a way for politicians to organize their thinking about policy making. Better to persuade politicians that the process ought to be rational (e.g., getting rid of conflict of interest). That is, the policy making process should rely more on political intuition and hence we should develop rationale for rational policy making, avoidance of all manner of conflict of interest, control over information flows and assumptions inherent in specific information, the place of explicit and implicit values and interests in policy making, the understanding of human interaction in the policy process. The education of politicians and the exposure of pragmatism are essential.

Unemployment and inflation data - the economic indicators - are unreliable. (Think of S. Ostry saying indicator of acceptable level of unemployment is no longer 3% but now 6 or 7%). Consumer price index measures averages, doesn't tell how badly off the poor are who have to allocate resources differently than others.

Economic and social indicators are insufficient help.

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"To philosophy as trans-scientific theory the human fact of science can provide a clue to a theory of man, so that we may know again about the essence of man--and through it, perhaps, even something of the essence of Being. Whenever such knowledge will again be with us, it can provide a basis for the supremely useful and much needed knowledge of ends."

--Hans Jonas²

1. Industrialization and the Advent of Impact Assessment

Industrial civilization apparently places a high value on "reason". Indeed, with the present course of industrialization beset by a complex array of problems, this is nowhere more evident than in the innovations of policy analysis intended to deal with these difficulties. It is ironic, though, that enterprises such as these, ostensibly devoted to the cause of reason, exhibit little critical reflection devoted to gaining an understanding of reason itself. Indeed, this is more than ironic: it is symptomatic of an unfortunate mystification which confuses reason with calculation, technique, and mechanization. Rationality is not understood in terms of its roots, scope, and limits. No visible connection remains between reason and wisdom; the idea of wisdom itself loses substance as it is reduced to a meaningless term.

This complex of ideas and attitudes can be regarded, more generally, as a world view, an ideology of industrialization³ which underlies the positivist orientation in philosophy and, at the same time, pervades much of everyday common sense. Mystification is a typical feature, then, of the present human context of science and technology. A serious examination of this context would require a critique of this mystification--a critique which would reflect on the meaning of reason, on what constitutes rationality.

Contemporary policy analysis has its roots in a tradition of social technology which dates back directly to the Enlightenment and which can be traced to the advent--particularly with Hobbes--of modern social thought. The most significant event in the development of social technology was the acceptance of the principle of a self-regulating market as a "natural" motor of progress which should be protected from "artificial" state intervention. The events and ideas of the twentieth century have partly undermined this principle: the "market failures" reflected in the obvious "externalities" of industrial expansion and technical innovation clearly call for some type of (more or less) coordinated response. Whether we are thought to be faced with a set of manageable problems or an awesome crisis threatening civilization itself, we can recognize that the extension of policy analysis--in technology assessment, environmental impact assessment, and social impact assessment--is the main response which has, in fact, emerged.

The historical significance of the advent of impact assessment can perhaps be seen most clearly in the case of social impact assessment (SIA). What concerns social impact assessment, "at the most general level", according to C.P. Wolf, "is the problem of estimating and appraising the condition of a society organized and changed by large-scale applications of high technology."⁴ The question I am raising here is whether such assessment can in principle be placed on a rational foundation. My purpose is not to provide

a final answer, but to offer a few suggestions which might provide a basis for further questioning. 292

2. Reason and the Art of Judgment

When we ask whether social impact assessment can be placed on a rational foundation, we are also asking whether industrial civilization can muster a rational response to the problems of industrialization. The advent of impact assessment, I believe, does represent an advance--however perhaps marginal and ambivalent--of reason in society. What is raised here, sometimes implicitly and sometimes explicitly, is a concern with the very pace and direction of change in industrial civilization. We are thus faced with three key questions: Where are we? Where are we going? Where should we go?

Can answers to such questions be based upon reason? Positivism answers that we can, in principle, give rational answers to the "factual" questions--"Where are we and where are we going?" However, the "value" question--"Where should we go?"--would seem to transcend the scope of reason. Reason is considered to be instrumental, a technique which can serve only to describe our condition and guide us in whatever direction we might decide. An unbridgeable gulf separates reason from decisions about ends: rational decision-making is strictly oriented to means. We are thus faced with a non-cognitivist view of ethics. The prospect of a rational basis for impact assessment hinges, then--in principle--not only on the possibility of rational answers to factual questions, but on the possibility as well of a "cognitivism" in ethical theory.⁵

In The Art of Judgment, Sir Geoffrey Vickers distinguishes between "reality judgments" and "value judgments".⁶ His discussion suggests to me that, while these can be distinguished analytically, they retain a common feature--a cognitive dimension: judgment. This is not to say that either form of judgment is capable of attaining the kind of absolutely certain, objective knowledge which has been sought in idealism and positivism. I would argue that what we can claim for cognition is strictly limited to what we can claim for our judgment as human judges, cognizant of both the capabilities and frailties which we are able to discern in ourselves. As we consider the human context of science and technology, moreover, we need to be aware that this is clearly an all-too-human context--indeed, that science and technology themselves are, similarly, all-too-human.

Idealism sought certain knowledge in judging both "reality" and "value". Indeed, the two were viewed not as separate, but as interwoven in an ontological whole. Positivism, maintaining a sharp dichotomy between the two realms, denies cognitive status to value judgments. Following from this positivist orientation, there is today a common tendency to view reality judgments as pertaining to a factual domain of "hard data" where objectivity and certitude can be attained. In contrast, value judgments are seen as somehow inescapably subjective and uncertain.

Speaking loosely, I would suggest that far more "certainty" is possible concerning value judgments than is acknowledged in the conventional wisdom. Conversely, the conventional viewpoint anticipates far more "certainty" concerning reality judgments than can be reasonably expected. These suggestions are offered for heuristic purposes. They clearly need to be refined and considered more thoroughly, but they may provide a general direction for research. In what follows, I will attempt briefly to pursue these ideas a bit further, and to consider their implications with respect to the advent of impact assessment, focusing especially on social impact assessment. I will suggest that, in order to be answered on a rational basis, the ques-

tions posed by impact assessment require a reappraisal of the values prevailing in industrial civilization--a revaluation of values which would begin with an examination of the value of rationality itself. 293

3. Value Judgment

What constitutes rationality? The short answer to this question, in my view, is commitment. The ideal of the Enlightenment was a communicative context in which all pretense and deception would be dropped in favour of a common effort to seek the truth. This ideal would clearly mean a particular form of social relationships. The membership of an ideal social form such as this would consist of autonomous individuals distinguished by honesty, civility, self-reflection, and a critical spirit. These qualities are, indeed, constitutive of reason. If we distinguish reason from the mystifying associations with calculation, technique, and mechanization, we can recognize that rationality is a mode of human activity animated by value. Reason cannot be detached from an interest in reason.⁷ This raises the question of the relationship between rationality and value judgment.

The term value judgment here is meant to refer to a phenomenon which can be distinguished from the sort of human experiences which we designate with words such as "want", "need", "desire", and "whim". A value judgment involves us in an effort to sort out our interests as human beings; it involves, implicitly at least, the question of identity.⁸ Such judgment is characterized by self-reflection in which the individual seeks to grasp a meaning in his personal existence and relationship to others. Value judgment is characterized by a sense of moral concern--in short, a value: a human interest in knowing what it means to be human. Standing back from an immersion in immediate experience, one consciously seeks a meaning in existence. In this sense, value judgment can be considered a rational process that is, moreover, itself constitutive of reason.

While value judgments involve the private experience of self-reflection, they are not restricted to that sphere. They can be publicly expressed, communicated to others. Indeed, value judgments can find public expression in an intersubjective rational process that seeks a common ground of meaning, a shared experience of what it means to be human. In such a process we could expect both agreements and disagreements. Nothing guarantees consensus on every issue--or an end to doubts, ambiguities, hard and painful decisions. But communication in such a setting would require, as a minimal condition, consensus on at least one question: the value of the process itself. Such collective effort presupposes individual commitment to a common interest: through their genuine participation, individuals would affirm a value committing themselves to an interest in reason. This commitment would, practically, require a further commitment--that, namely, of promoting human relationships conducive to the specific political, social, and psychological conditions necessary for a rational process to be established and maintained.

A communicative space would be necessary where individuals would be encouraged to discuss, recognize, and articulate their interests in an ongoing process: a realm in which values could be openly discussed, judged, and perhaps revalued. But this could not simply be a temporary social island. In their daily affairs, the individual participants would need to encounter a texture of social relationships conducive to autonomy and an interest in reason.

Social impact assessment confronts a problem of value judgment: the question, "Where should we go?" I am suggesting that such a question could in

principle be answered on a rational basis. But in saying this, I have not identified the rational agents who are to take part in the decision. With its concern for the place of reason in collective life, political philosophy has traditionally been divided between aristocratic and democratic approaches to this question. 294

In the aristocratic view, reason is the preserve of an elite which legislates for a subordinate, essentially irrational, larger society. For the democratic view, in contrast, the boundary between elite and non-elite is less distinct and more permeable: education--in the broad sense of that word--is to provide for both a rational political order and the firm foundation of a politically active, rational society.⁹ Rather than delving here into the complexities of this issue, I will merely state that--in my judgment--the democratic approach is preferable to the aristocratic.

In the present historical situation, I would argue that, at any rate, the choice is not between democracy and aristocracy. We are faced, rather, with a tension between oligarchical and democratic tendencies. In our time, the oligarchical tendencies appear in a technocratic guise, while the democratic tendencies are oriented towards the ideal of what Carole Pateman has termed a "participatory society".¹⁰

This tension, at a broad social level, is reflected in a tension in social impact assessment between technocratic and participatory orientations (a distinction which I have elsewhere elaborated upon in detail).¹¹ With an emphasis on technique and expertise, the technocratic type neglects the significance of the social context of analysis. In contrast, the participatory type focuses on process and recognizes that SIA is intimately bound up with a larger context of social forces. Indeed, the technocratic approach tends to mystify SIA by obscuring its social character.

This does not mean to suggest that the technocratic approach is unconcerned with "public opinion" and "individual preferences". But from this viewpoint, opinions and preferences tend to be taken at face value and regarded as fixed.¹² Concern with opinions and preferences implicitly appeals, however, to a deeper notion--an ideal of freedom. In accord with this ideal, we attribute significance to opinions and preferences inasmuch as we judge that they have been formed autonomously. We distinguish, for example, between the infant and the adult. We also consider whether the individual is somehow mentally aberrant, deficient, or incapacitated--somehow frightened, deluded, or mystified. At least implicitly, then, we focus attention on the life histories and social contexts of individuals--particularly on the communicative context in which they learn about themselves and their world. Accordingly, we might ask, for example, whether preferences expressed in "the high intensity market setting" should be regarded, at face value, as autonomous.¹³ With its accent on process, the participatory orientation would--in contrast to the technocratic--allow for this question to be seriously posed. A re-form of the communicative context could at least be considered, and the possibility would be left open for a collective reevaluation of values.

4. Reality Judgment

The technocratic orientation in SIA typically adopts a focus in which the accent is upon a narrow range of considerations which can be handled smoothly, almost automatically, with a set of standardized, technical procedures. There is a lack of sensitivity to context and a failure to recognize the social significance of the process of analysis itself. In contrast, the participatory approach is marked by a sensitivity to context and a concern

In fact, as a departure from the narrow economic orientation of much conventional policy analysis, social impact assessment--in principle--brings into consideration a wide range of questions calling for reality judgments: some are narrow and can be answered in a fairly clear-cut manner with well-founded numerical data; others, typically the most important, are broad and comprehensive ones which resist efforts completely to avoid ambivalent answers. By its own logic, in short, social impact assessment is forced out of the detached setting of social technology and into the concrete world of social life. In social impact assessment at its best, careful research and analysis provide a guide, but not a guarantee.

With its emphasis on technique and expertise, the technocratic approach exhibits a product orientation that is generally characteristic of conventional policy analysis. The participatory approach, in contrast, emphasizes a process orientation. Let us be clear about this distinction. In the product orientation, the researcher adheres to the conventional image of the social scientist as a detached observer; as a social technician, the researcher collects and analyses data in order to evaluate them by some criteria and to arrive at a product: a policy prescription. In contrast, the process orientation is guided by the awareness that in social inquiry, the researcher's actions are significant: researchers engage in a social process, affecting it and being affected by it. Here the individual researcher does not abandon the effort to achieve a rational level of analysis, but he also does not allow himself to be deluded by a false image of neutrality. The researcher, aware that he is part of a complex and shifting process, knows that to adopt a mask of neutrality is itself an act of profound social significance.¹⁴

The deceptive aura of neutrality which often surrounds policy analysis reflects what is really the most fundamental problem in achieving rationality in judgments of reality. Put briefly, the policy arena is characterized by a communicative context of strategic interaction:¹⁵ by posturing and politicking; rhetoric, ploys, gambles, deals, and deception. Since all grown-ups are aware of this fact of life, how should we interpret the utilization of modes of analysis which systematically down-play or conceal this reality? I would venture to say that we must read here, at least in part, the workings of a strategy not completely guided by an interest in reason; other--perhaps more significant--interests enter the scene. There is at least a measure of pretense. To achieve rationality in reality judgments, however, we must strive to drop all pretense and get on with the task--complex enough in itself--of sorting things out.

The discussion so far has meant to suggest that a "reality judgment" often involves far more than a simple accumulation of "hard facts". We are necessarily involved in rough and ready guesswork, in following our hunches and attempting to sort out with what wits we have an incessant and often bewildering experience of the world. "We live," as W. I. Thomas once said, "by inference."¹⁶ This has been partially recognized in the suggestion by Alvin Weinberg that some reality judgments are "trans-scientific" since they involve questions which, either in principle or in practice, cannot be answered unambivalently by scientists.¹⁷ Giandomenico Majone has pursued the implications of this. He advances the idea that analysis should be viewed less according to a scientific model and more along the lines of a "generalized jurisprudence":

"Before worrying about decision rules, utilities, optimality and all other categories of decision analysis, one must be able to assess the adequacy

of arguments, the strength and fit of the evidence, the relevance and reliability of data, the intrinsic limitations of scientific tools, the pitfalls lurking in every technical conclusion. To get to the "truth", the analyst will have to rely not on models and algorithms, but on advocacy and the adversary process. The supreme analytic achievement is no longer the computation of optimal strategies, but the design of procedural rules and social mechanisms for the assessment of incomplete and often contradictory evidence.¹¹⁸

In my view, this idea deserves serious consideration. It has the merit of recognizing the fragility of reality judgments and of focusing attention on the significance of process. Majone rejects a simple reliance on expertise and conventional wisdom. Accordingly, he argues that, in an adversary process, deliberate steps should be taken to strengthen the weaker, less popular points of view. In a time when it is hard even to imagine the rational ideal of a policy process free from strategic interaction, such a suggestion offers at least a glimpse of how such an ideal might be approximated.

5. Conclusion

Where are we? Where are we going? Where should we go? I have suggested that these questions underlie social impact assessment and the advent of impact assessment generally. Indeed, they are central to a consideration of the human context of science and technology. I have raised the issue whether such questioning could in principle be based on a rational foundation. My view (as it has so far developed) is that answers to such questions could emerge from a rational process--a process characterized by a commitment to critical discourse and self-reflection on the part of the participants. I am not suggesting that such a rational process would end in unambivalent and certain answers which could tell us clearly what course of action we should decide to take. Rationality remains human, all-too-human--a frail and uncertain undertaking which can be sustained only with the will to sustain it. Nothing ensures that, even with a collective commitment to reason, people would not make mistakes. But with a genuine commitment to reason, they could never lose sight of the possibility of making mistakes. They might even be able then to speak again of wisdom.

I have no illusion that a rational foundation is present in the current "state of the art". Although I have argued that such a foundation could in principle be developed, I also have no illusion concerning the enormous practical difficulties which would be encountered in an effort even to approximate this ideal. Can there be any doubt, however, on rational grounds about the priority of making the effort?

NOTES

1. This essay draws upon the conclusions of a larger study. See D. Torgerson, Industrialization and Assessment: Social Impact Assessment as a Social Phenomenon, Special Monograph: President's Advisory Committee on Northern Studies, York University, Downsview, Ontario (forthcoming 1980). A summary statement, "Social Impact Assessment as a Social Phenomenon: The Problem of Contextuality", will appear in Frank Tester, ed., Social Impact Assessment: Theory, Method, and Practice: Proceedings of the First Canadian Symposium on Social Impact Assessment (forthcoming 1980).
2. Hans Jonas, "The Practical Uses of Theory" in Maurice Natanson, ed., Philosophy of the Social Sciences, New York: Random House, 1963, p.142.

3. This term is employed in David Dickson, Alternative Technology and the Politics of Technical Change, Glasgow: Fontana/Collins, 1974. I use it here in a broader sense. For a fuller discussion, see the work cited in n. 1 above.
4. C. P. Wolf, "Social Impact Assessment: The State of the Art Restated", Sociological Practice, 1:1 (Spring 1976), p.58.
5. For a significant positivist statement in the policy literature, see Herbert A. Simon, Administrative Behavior, New York: The Free Press, 3rd ed., 1976. Cf. Peter G. Brown, "Ethics in Policy Research", Policy Analysis, 11:2 (Spring 1976). For a sample of the debate on cognitivism versus non-cognitivism, see Carl J. Friedrich, ed., Rational Decision (Nomos VII), New York: Atherton Press, 1964, particularly the contributions by Kaplan, Oppenheim, Berlin, and Lindblom. For a general discussion explicitly related to policy literature, see Abraham Kaplan, The Conduct of Inquiry, San Francisco: Chandler, 1968, Ch. X. My views on this question have been influenced by Habermas (see n. 7 below).
6. See Sir Geoffrey Vickers, The Art of Judgment: A Study of Policy Making, London: Chapman and Hall, 1965.
7. See Jurgen Habermas, Knowledge and Human Interests, trans. Jeremy J. Shapiro, Boston: Beacon Press, 1971. Anyone familiar with Habermas will be aware of my debt to him. The most accessible route to his ideas is provided by Thomas McCarthy's remarkable book, The Critical Theory of Jurgen Habermas, Cambridge, Mass.: The MIT Press, 1978. A useful bibliography is included. Cf. Kai Nielsen, "Rationality, Needs and Politics: Remarks on Rationality as Emancipation and Enlightenment", Cultural Hermeneutics 4(1977) and "Technology as Ideology", Research in Philosophy and Technology, 1 (1978); Regis A. Factor and Stephen P. Turner, "The Critique of Positivist Social Science in Leo Strauss and Jurgen Habermas", Sociological Analysis and Theory, VII:3 (October 1977).
8. For some elaboration of the question of identity, see D. Torgerson, "Domination and Liberatory Politics", Canadian Journal of Political and Social Theory, 2:1 (Winter 1978).
9. Cf. C. B. Macpherson, The Life and Times of Liberal Democracy, Oxford: Oxford University Press, 1977; Jurgen Habermas, Toward a Rational Society, trans. Jeremy J. Shapiro, Boston: Beacon Press, 1971. Also see David W. Orr, "U. S. Energy Policy and the Political Economy of Participation", Journal of Politics, 41:4 (November 1979).
10. See Carole Pateman, Participation and Democratic Theory, Cambridge: Cambridge University Press, 1970, Ch. VI.
11. See n. 1 above.
12. On opinions, see Friedrich Pollock, "Empirical Research in Public Opinion", trans. Thomas Hall, in Paul Connerton, ed., Critical Sociology, Harmondsworth: Penguin, 1976. On preferences, see Peter Victor, "Economics and the Challenge of Environmental Issues" in William Leiss, ed., Ecology versus Politics in Canada Toronto: University of Toronto Press, 1979.
13. See William Leiss, The Limits to Satisfaction: An Essay on the Problem of Needs and Commodities, Toronto: University of Toronto Press, 1976. Cf. the debate between Leiss and Alkis Kontos in the Canadian Journal

of Political and Social Theory: 1:1 (Winter 1977), 1:2 (Spring-Summer 1977), 2:1 (Winter 1978), 3:1 (Winter 1979).

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14. Cf. Laurence H. Tribe, "Policy Science: Analysis or Ideology?", Philosophy and Public Affairs, 2:1 (Fall 1972) and "Technology Assessment and the Fourth Discontinuity: The Limits of Instrumental Rationality", Southern California Law Review, 46 (1972-73). Also see D. J. Gamble, "The Berger Inquiry: An Impact Assessment Process", Science, 199 (March 3, 1979).
15. Cf. Erving Goffman, Strategic Interaction, New York: Ballantine, 1969.
16. W. I. Thomas, "The Relation of Research to the Social Process" in Morris Janowitz, ed., On Social Organization and Social Personality: Selected Papers, Chicago and London: University of Chicago Press, 1966, p. 301.
17. See Alvin M. Weinberg, "Science and Trans-Science", Minerva, X:2 (April 1972).
18. Giandomenico Majone, "Technology Assessment and Policy Analysis", Policy Sciences, 8:2 (June 1977), p.174. Cf. Henry M. Hart, Jr., and John T. McNaughton, "Evidence and Inference in the Law", Daedalus, 87:4 (Fall 1958).

Kimon Valaskakis and Iris Fitzpatrick-Martin

INTRODUCTION

This paper focuses on the problems and opportunities associated with the emergence of an Information Economy. It specifically emphasizes the socio-political costs and benefits rather than the economic which, quite properly, should be the object of a separate paper. It is divided into three parts, as follows: the first outlines the evidence confirming the emergence of the Information Economy; the second depicts three scenarios for a future Information Society and the importance of "content", i.e., what kind of information we will be dealing with; and the third looks at the potential costs and benefits. A selective bibliography is appended to guide the reader interested in further readings.

This paper is based on work done by the GAMMA GROUP for the Federal Department of Communications and entitled The Information Society Project. Phase II of this project is currently underway. Copies of the report on Phase I of the Information Society Project, as follows:

The Information Society: The Issue and the Choices
K. Valaskakis.

The Micro-Economics of Information, Structural and Regulatory Aspects: J. Bernstein.

Macro-Economie de la Société informatisée:
R. Jouandet-Bernadat.

La Poussée Technologique et les coûts unitaires décroissants en télématique: J. Louis Houle.

Public Policy and the Information Society:
Peter S. Sindell.

Social Implications of the Information Economy:
I. Fitzpatrick-Martin.

Research and Development in the Information Sector of the Canadian Economy: R. Wills.

are available at:

GAMMA/University of Montreal
3535 Queen Mary Road, Suite 210
Montreal, Quebec H3V 1H8.

A. EVIDENCE OF THE EMERGENCE OF AN INFORMATION ECONOMY.

1. DEFINITION AND MEASUREMENT.

An agricultural economy is based on the extraction of crops involving very little transformation of value-added. An industrial economy involves considerable transformation of raw materials into finished manufactured goods. Its distinguishing feature is the importance of the "throughput" process (1), a capital intensive, energy-consuming industrial mode of production. An "Information" Economy, by contrast, is not principally involved with the production of goods whether lightly or heavily transformed, but with the flow of information. This does not mean of course that there is no throughput sector, but that the relative importance of the information sector is quite high.

The pioneering work of identifying and measuring the emergence of an Information Economy was performed by Marc Uri Porat's team in the U.S. (2). The evidence from that study seems to point to quite startling results. Between 40-50% of the U.S. and of the Canadian GNP originates in the information sector. Moreover, information workers account for around 50% of the U.S. and approximately 40-45% of the Canadian labor force. In particular:

a) The primary information sector in the U.S. amounted in 1977 to:

- 21.9% of gross expenditure
- 21.5% of value-added and
- 26.9% of the GNP.

b) The secondary information sector amounted in the same year to:

- 3.4% of gross expenditure
- 21.1% of value-added and
- 24.7% of the GNP.

It would appear then that the Information Economy is no longer to be viewed as a "far-out" concept but as the present and future state of things.

- (1) K.Valaskakis, P.S.Sindell, J.G.Smith, E.I.Martin: The Conserver Society. N.Y., Harper and Row, 1979. Pp.25-42.
- (2) M.U. Porat: The Information Economy. U.S. Department of Commerce, 1977, 5 volumes.

The principal process of change leading to the emergence of an Information Economy is still not properly understood. Even naming the process provokes controversy. The term that was adopted by GAMMA in its recent report to the Federal Government on this issue, and which was coined by Iris Fitzpatrick-Martin, is inmediation.⁽³⁾ Inmediation is the processing, storage and transfer of information. In a large sense, this includes all forms of information processing from the simple marker of the cave man, to the contemporary "word-processor", a computer-assisted typewriter. Although immediation has been with us since the beginning of time, a sharp rise in its potential, comparable in scope to a full-fledged scientific revolution, is evident in the last twenty years. This explosion of immediation is the principal dynamic factor in propelling us into the Information Age.

Three underlying causes lie behind the current emergence of the Information Economy. They are, in order of importance: (1) technology-push; (2) increased demand for information as a producer-good; (3) increased demand for information as a consumer-good.

(1) Technology-Push:

Two initially separate but now converging sectors have recently undergone what can reasonably be described as revolutionary change. The first sector is that of computer technology. In the last twenty years, the revolution in computers has manifested itself in three ways: miniaturization of the hardware, enormous increases in computing capacity and massive reduction in costs per unit.

The second revolution has occurred in telecommunications technology. Co-axial cables, telecommunications satellites and fibre optics have created an enormous potential, not just for one-way, but for multi-way telecommunications. The telephone system has become the foundation of what could become a world electronic highway. The combination of the micro-computer and the telecommunications nexus has a potential comparable to that of the steam engine in the first industrial revolution.

(3) See: The GAMMA Report on the Information Economy, Phase I.

The need to "know" in order to compete is increasingly evident in most fields of economic activity. This explains the proliferation of consultants, R & D activities and the multi-branched knowledge industry (including education, publishing, mass media, etc). This increased demand for information as a producer-good creates a feedback stimulus which further promotes technological innovation in this field.

(3) Increased Demand for Information as a Consumer-Good.

The demand for information is income-elastic. This means that as personal income rises, the demand for information rises, in some cases, more rapidly than the income rises. This high income elasticity coefficient is best analyzed by reference to a stages-of-development approach which describes behavioral change on the basis of a hierarchy of needs.

The celebrated hierarchy of needs proposed by Maslow argues that an individual wishes to satisfy his basic physiological needs first, then his security needs, and finally, his "psychological" needs.

What is argued in effect is that a society undergoes stages of development. The initial stage is geared to the satisfaction of the biological needs. The economic system to achieve that purpose is a pre-industrial society - either primitively-nomadic or sedentary-agricultural. The next stage in development is the industrial economy where comfort and convenience are achieved via the mass production of industrial goods - shoes and ships and sealing wax. The third stage of development is the post-industrial one which was long considered to be dominated by services. More likely, the post-industrial age is the information age, with information goods (both manufactured and abstract), dominating the economy. Most of the OECD countries have now reached that stage, and the proportion of information expenditures to total expenditures attests to that fact.

B. THREE SCENARIOS FOR AN INFORMATION SOCIETY.

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1. DEFINING THE INFORMATION SOCIETY.

Having identified the central process of change and its principal causes, we can now propose a definition of the Information Society as follows:

An Information Society is a set of social relationships based on an Information Economy. In turn, the Information Economy exists whenever over 50% of the Gross National Product belongs within the broad information sector.

This definition, inspired by the Porat-OECD approach, implies once again, the division of the economy into a high-throughput sector (processing energy and materials) and an information sector (processing symbols rather than goods, bits rather than BTUs). It also implies a certain amount of economic determinism since it assumes that the configuration of society is largely influenced by its economic base. The proportion "50%" is, of course, arbitrary but nevertheless, meaningful. By this standard, most of the OECD countries are either already Information Economies, or very close to becoming so.

It must be once again emphasized that because of the generality of the Porat-inspired definition, many pre-industrial or non-industrial economies may also be considered information societies. Thus, all religion-based societies (where religious activity is an important proportion of total activity) would qualify. Religion is, of course, by its very essence, an information activity. We may refer back to an earlier mention of Teilhard de Chardin to note that this Jesuit theologian sees knowledge as Divinity and Man's quest for salvation as essentially an informational one. Man's attempts to elevate himself into the "noosphere" is the culmination of Chardin's evolutionism.

2. THE "TELEMATIQUE" SCENARIO.

"Télématique" is a French neologism which is a contraction of "télé-informatique" or computer-telecommunication (5). In essence, the Télématique Scenario describes the society that would result from a high integration of the communication nexus and computers. It assumes the existence of a central "electronic highway". This so-called highway would include the cable (either telephone or television, and most likely both in Canada), and communication satellites. The

(5) Nora, Simon, and Alain Minc: L'Informatisation de la société. Paris, Documentation française, 1978, 163 p.

cable would wire the office, the home, and the factory and create the long-awaited wired city, wired region, and wired country. Communication satellites would complement the wired country and create an international electronic highway (or airway) in this case. The net result would be a global village of a scale and of a dimension unthought of in McLuhan's early treatises. At the base of the entire télématique system is the ubiquitous micro-processor without which this particular scenario would not be possible.

The télématique office will likely be almost "paperless". Word-processors, data-bank terminals, "intelligent" computer terminals, high-speed facsimile printers, will probably drastically reduce office staff and fundamentally alter the whole concept of bureaucracy. (6)

In essence, the télématique home will be centered around the television set. Fed by the telephone wire and/or the CATV cable, it will be the instrument of two-way, interactive communication. Already, with existing cables, the number of channels available in Canadian homes will be close to 35. These channels will be supplemented by custom-made entertainment via videotape recorders and the multiplying tribe of video-games. With the eventual introduction of fibre-optics, the channel capacity of home TV will increase to hundreds if not thousands. Supplementing these increased channels will be teletext and video-text machines such as CEEFAX, ORACLE, ANTIOPE, TELIDON, or VISTA (7), bringing more data into the home and allowing the viewer to respond interactively.

The computer aspect of the home may be also described. At most stages in this communication process, a micro-computer will be involved. When the home terminal will become an "intelligent terminal" rather than a mere glorified television set (as is the case with some of the present technology), then much of the "thinking" presently done by individuals will be delegated to these home computers. Fed by international data-banks and interactive cable, the télématique home will be inexorably bound to the electronic highway.

The télématique factory will be highly automated like the office and the home. Computers will not only assist in production, but also in design, a field hitherto reserved for human intelligence. Some cling to the idea that there are limits to what a computer can do. Others will point out that whenever such limits are discovered, they are transgressed a few years later. The new science of robotics

(6) For a description of such an office, see Robert Russel, The Electronic Briefcase: Office of the Future. Institute for Research on Public Policy, 1979.

(7) Several versions of the teletext machine.

examines these questions and in a general way looks at the pattern of automation in industry. The prognosis seems to be that labor-replacing robots will be increasingly taking over almost every aspect of production.

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Not only will the télématique office, home and factory of the future be fundamentally different from today, but even the office/home separation is likely to disappear. Whatever the residual bureaucrats do at the "office" they could probably equally well do at home. Better still, the complete communications-computer vehicle could be encased in an electronic briefcase possessing in miniaturized form all that is needed to "plug" the executive into the central electronic highway.

The list of further applications of télématique is long. It may include:

- electronic funds transfer (the cashless society)
- electronic mail (the letter-less society)
- tele-shopping
- tele-medicine
- tele-voting in instant referenda
- etc.

The date of effective commercial application of télématique in each of these sectors is of course not known, but it is a safe bet to contend that all the above applications may be in place by the end of the century and the great majority, in some form or other, within 10 years, that is, if the télématique option is given the full go-ahead.

One important final addition to the central electronic highway is the communication satellite. This satellite will extend the electronic highway across international borders to integrate the entire world. No area on Earth will be too remote to resist penetration via satellite communication. What the cable will do to wire the télématique city and country, the satellite can do to "wire" the world. In a sense, the feeling of a world electronic highway already exists with direct-dial intercontinental calls since with the same nonchalance as that involved in a local call, it is possible to communicate by telephone with the farthest corners of the globe. The world electronic highway will enhance that communication potential by allowing trans-border data flows on a scale unparalleled in history.

The central electronic highway is a very sophisticated communication system, but what will it communicate? What content will fill the airwaves, the cable, and the satellites? What messages will be piped into the home and the office? These questions are portentous indeed and admit to many answers. Such answers fall into three categories, each of which may become the basis for a variant of the Télématique Scenario.

(Central electronic highway with increasingly trivial content)

The projection of present trends seems to indicate that the most likely version of the Télématique Society, at least in the short-run, is the trivial one. What this means is that the individual will be increasingly assaulted by trivial information or unwanted data. A few examples will illustrate this idea.

- I) One of the best-sellers of 1978 was the so-called Book of Lists, a compendium of trivial facts.

There is also the perennial Guinness Book of Records, and now various other compendia such as "The Book of Rules", "1001 Wise Saws", etc.

Interestingly, the data presented on existing teletext-videotext machines seem to follow the Book of Lists anecdotal pattern which is billed as "entertainment". For straight information, the data is communicated with considerable drabness. To read the present teletexts is as adrenalin-provoking as studying a phone book! Ask the information terminal a question and you get a computer printout...with one long list!

- 2) Trivialization of TV series. TV-plots, now frequently churned out by superficially programmed computers, seem to follow an increasingly standard pattern. The homogenization of content in the home entertainment of the future will thus become complete. Only, instead of seeing it on three channels, we will now be able to view the same plot on hundreds.
- 3) Trivialization of life-styles. The already popular characterization of the TV set as an "idiot-box" or "boob-tube" may well become a self-fulfilling prophecy. The result may be a trivialization of life-styles increasingly imitating the trivial models that are viewed via the central electronic highway.

TELEMATIQUE TWO

(Central electronic highway with totalitarian or socially-destructive content).

A far more ominous and not completely improbable possibility is the totalitarian control and utilization of the central electronic highway to promote a particular ideology. One shudders at the thought of a Hitler or a Goebbels at the controls of the c.e.h. penetrating into everyone's office and home. Already, there are some "mild" versions of the use of the TV system to advance particular thought-processes. Here are some examples:

- 1) The televised religious revivals (Billy Graham, Maharishi Mahesh, Oral Roberts, the Reverend Moon, and the Moonie Sect). An interesting case of "télématique" religion is the Iranian experience in 1978-79. Although ostensibly the Iranian Islamic movement is anti-western and by extension anti-technology, one method of crowd-mobilization by the Ayatollah Khomeini while he was in exile in France was the audio and video cassette. The opposition to the Shah, having been eliminated from the streets and public places, could only thrive in the sanctuary of the Mosque. It was within the confines of the Mosque that audio-cassettes of the Ayatollah were heard with his instructions. In addition, secret meetings using video-recorders were held in private homes with video-tapes of the Ayatollah. Paradoxically then, one of the chief instruments of the 1978-79 Islamic revival in Iran was an avant-garde instrument of the télématique society.
- 2) Télématique potentially both increases and limits the power of advertising. The increase in the power of advertising stems from additional channels of communication (not only to people's homes, but more fundamentally, in people's minds). Skillfully handled, the c.e.h. becomes a prime vehicle for thought re-conditioning. This potential is, at the same time, limited by the very diversity and self-competitiveness resulting from channel multiplication and information redundancy. The network-TV viewer, hitherto a captive audience, may now escape by switching channels, playing his video-tape recorder or his programmable video-games. On the other hand, if the same organization controls most of the channels, it may condition the viewer to a particular way of thinking in as many ways as there are channels. The diversity would be fictitious and the Orwellian dystopia of total control, at hand.
- 3) Objectionable or "evil" content. The multiplication of channels and universal access to data creates another, less ominous, but nonetheless real danger: that of piping into homes objectionable content. This content could be objectionable in the sense of assaulting privacy, avoiding censorship, presenting extreme violence, etc. Traditionally, violence and shock-value have been used to lure audiences back to a medium threatened by a sister-medium. When the film industry was threatened by TV in the fifties and sixties, it responded by escalating sex and violence to reconstitute its depleted audience. A replay of this tactic is already in the works as various TV-networks compete for viewer attention with more sex and violence. With the proliferation of information channels, this war of escalation of shocking content may continue with the apparent consent of the viewer (who voluntarily switches on the high violence movie), but to his longer-term detriment.

(Central electronic highway with ideal content)

This third variant of télématique is, by definition, the most desirable one, but there is no guarantee that it will necessarily come about. Obviously, the information travelling along the electronic highway should be in the "public interest". Unfortunately, no one has a clear notion of what the public interest is or should be (see later under social costs and benefits). We face here a real and, at the same time, inevitable dilemma. We cannot ignore public interest as a policy-guide because if we did, there would be no criteria to assess public policy. At the same time, most hasty definitions of that elusive concept will in fact be promoting one or other special interests of particular groups. The task of public policy must be nevertheless to explicate that difficult idea and base itself on it, however monumental that task proves to be.

3) THE "PRIVATIQUE" SCENARIO.

An interesting counterpoint to the Télématique Scenario has been advanced in France by Bruno Lussato. (8) His thesis is that a) the future belongs to small computers and not to large ones, and b) that it is as it should be. An original contributor to the annexes of the Nora-Minc Report, Lussato both espouses high technology information systems and rejects télématique.

What he calls the "privatique" option is neither aggressive nor defensive. It is geared to cater to the needs of the private individual. The Privatique Scenario envisions a highly decentralized, highly individual use of computers to enhance rather than stifle a person's potential. The micro-computer becomes an added instrument of human fulfillment and an extension of his personality - not unlike the calculator, the camera, the typewriter or even the paint brush. Therefore, in the privatique option, all citizens should be instructed on how to use computers to satisfy their needs. (This argument is reminiscent of Jean-Luc Godard's plea during the student dissent in 1968 in Paris, in favour of universal ownership of movie cameras. Give the camera to the people, said Godard, to allow them to reach self-fulfillment).

If decentralization is accepted as desirable and possible, the privatique option may take one of many forms.

PRIVATIQUE ONE

(Individual symbiosis with a computer)

In this variant, the Jean-Luc Godard-type approach is maximized. The computer is a personal computer, almost as personal as a toothbrush. It is an auxiliary memory, a design aid, a thinking aid, a very private tool. Ultimately, a personal symbiosis with a computer could become as commonplace as our dependence on eye-glasses, vitamins or tobacco.

(8) Lussato, Bruno, and Jean Bounine. Télématique ou Privatique. Paris, Les Editions de l'informatique.

PRIVATIQUE TWO*(Small-group territorial interaction)*

Whereas the Privatique One variant is a movement to extreme individualism, Privatique Two could make the local territorial community the principal unit of information. Community cable systems, neighbourhood time-shared computers, local clubs, etc. can all be features in a system designed to foster and promote regional identity. The scale of the privatique unit could vary depending on the purpose but the overall criterion would be territorial.

PRIVATIQUE THREE*(Small-group non territorial interaction)*

In that third variant, the unit of decentralization becomes, not the territorially-based group as in Privatique Two, but the non-territorial affinity group. Thus, groups of stamp-collectors, chess-players, poets, or Humbrey Bogart fans could communicate via interconnected information systems in order to promote their special interests. The TV channels could then be reserved for special purposes and used to further diversity rather than uniformity. One example of what could be termed a cross between privatique and télématique is the computer-conferencing networks set up between scientists from various parts of the world. The selective grouping of certain people into affinity networks therefore becomes a third version of the individualized, diversified, high-technology Information Society, which can be generically referred to as the Privatique Option.

4. THE REJECTION SCENARIO.

Both télématique and privatique have in common the full acceptance and utilization of sophisticated information technology.

A third class of scenarios can now be identified which have in common the rejection of information in favour of a return to more traditional forms of communication. What is rejected is not the Information Society, but the high-technology version of it. A low-technology Information Society is instead chosen. This scenario would in fact be an analog to the intermediate technology movement in the economic growth vs no-growth debate. The intermediate technology advocates argue for a society at the human scale ("small is beautiful") with soft and appropriate technologies. Its Information Society counterpart boils down to the privatique option minus the computer and the television set, big or small.

The Rejection Scenario is quite plausible, at least in the medium-run, for three reasons. First, the danger of trivialization of content resulting from over-production of information may have the effect of "turning people off the medium entirely". It is not uncommon to discover that a telecommunications specialist would much rather read a book than sit before the "book-tube". A growing elite will take note of the growth of information instruments and yet look down upon them in contempt.

Secondly, quite apart from the trivialization threat, there is an adaptation time needed for consumer acceptance of new products. This adaptation-time may be much longer than originally supposed. One of the reasons why the much-heralded wired city did not yet fully materialize is because of consumer resistance to some of its technological components. Impersonal airports, expressionless answering services, synthetic voices, the beep of the computer's keyboard, the strangeness of newsread from a television screen rather than in newspapers, the mythology surrounding robots - are all elements favouring a short-run Rejection Scenario. After all, there have been a sufficiently large number of science-fiction works (1984, *Brave New World*, etc) or films (Jacques Tati's *Playtime*, Kubrick's *A Clockwork Orange*, Woody Allen's futuristic satires, etc.) to discredit a humanless scientific future.

Thirdly, the development of these new information devices may trigger a new revival of quality in the traditional media such as books, ballet, live music, visual arts, painting.

Similarly, it is quite possible that because of the potential competition from hundreds of TV channels, novels and plays will concentrate on superior content and very high quality. The performing arts may experience a revival and the dozens of TV games, videotext-teletext, data banks, lie unused while consumers take time off to go to the opera - in perhaps the same ritual pomp and circumstances as in late Victorian times: The Rejection Scenario would still be an Information Society but of a very different sort from either *télématique* or *privatique*.

Like the other scenarios, Rejection can take on many variants, two of which are likely:

REJECTION ONE

(Growth in low-technology communes, encounter groups, person-to-person communication).

In this version, people begin to rediscover each other in non-mediated, "live", direct interaction. We experience a revival of the encounter group or sensitivity session of the late '60s. Emphasis is on physical touching, physical feeling, physical experimenting. There is a continual quest for mutual discovery. Simple unmediated art-forms such as mime, body-language, disco-dancing, shiatsu, ballet-jazz, yoga, martial arts, yoga, martial arts, Tai-Chi Chuan, are favoured. The California-style informal commune becomes increasingly fashionable. The counter-culture becomes the dominant culture.

(Growth in organized cultism, territorial affinity groups, structured ideologies based on low-level technology).

In this alternate version, the individual, one-on-one, unmediated interaction develops into a cult with its cult-leader and a cult-followers. The main commodity transacted is information which is dispensed by the cult-leader. The information technology used is intermediate and will seldom go beyond public address systems or ordinary audio recorders. At times, the cults can become religious movements. Some examples of these organized low-technology Information Societies:

- The People's Temple in Guyana, scene of the recent mass-suicide under the spiritual leadership of "Reverend Jones".
- The Apostles of Infinite Love in the Quebec Laurentians.
- Various California-based cults.
- The almost universal revival of religion in the world: the contemporary Islamic revival in Iran, Libya, Turkey, Afghanistan, and Pakistan; The strength of Buddhism, Hinduism and other eastern religions. As for Christianity, the recent encyclical of Pope John-Paul II is almost a textbook example of a new religious doctrine, casting doubts the desirability of unbridled growth of technology, be it informational or otherwise.

"Man cannot and must not become
the slave of things, the slave
of economic systems, the slave
of technology."

The inadequacy of a high-technology communication system with low-quality content to go with it is, in the final analysis, the greatest factor acting in the direction of a Rejection Scenario. The home terminal can give data but can it give meaning? The existence of the various scenarios and their plausibility attests to the validity of the central diagnosis: the problem of the Information Society is not just a question of the medium. The message is of paramount importance. Unless meaningful content can be infused into the system, the Information Society can take many directions, not all of them desirable.

C. POTENTIAL SOCIAL COSTS AND BENEFITS

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Scenarios of the Information Society will have to be carefully assessed in terms of their compatibility or incompatibility with higher individual and social objectives. An assessment is impossible without evaluation criteria. If the criteria are explicated, then, although subjectivity remains, the evaluation standards may be submitted to scrutiny. An overall evaluation of the costs and benefits of the Information Economy must be made at both the private and social levels. This implies a separate set of criteria for private and public needs.

1. COLLECTIVE COSTS AND BENEFITS.

Collective needs crystallize around collectivities and in Canada, there are many competing collectivities. Ideally, they should merge into the notion of the "public interest", without which public policy would have no object. But what is the public interest in Canada? It is what the Prime Minister says it is? Is it what Parliament proclaims it to be? Is it what the provincial governments want? Is it what vested interests - business, labor, consumers - are interested in? None of these descriptions of the sources of "public interest" are satisfactory. yet the notion cannot be shelved. What in fact can be said is that there are levels of public interest depending on the collectivity one would like to focus on.

At the national level, it would appear that the public interest, as far as the information sector is involved, comprises at least three elements:

- Canadian "sovereignty" (which is a political concept)
- Canadian "identity" (which is a psychological concept emphasizing the difference between Canada and the U.S.)
- and National "unity" (which is a political cultural idea).

We have excluded the economic objectives, which are well-known and which include: growth, better distribution of income, low inflation, low unemployment, and balance of payments equilibrium. The three "social" objectives mentioned above reasonably correspond to what the central government and the House of Commons, as articulators of public opinion, believe this collective interest to be.

Canadian sovereignty is threatened, not aided, by the information revolution, for the same reason that all sovereignties are challenged by this process. The idea of sovereignty is linked with the capacity of a nation-state to control what is entering and what is leaving its borders. The world electronic highway with satellites, etc. will make trans-border data flows so easy that their control would become practically impossible.

Canadian identity is similarly threatened because of the relative size of the U.S. and Canada. The reception of U.S. TV, which is likely to become more and more widespread with the eventual introduction of pay-TV, will rob the airwaves of "Canadian content" which, for good or for ill, keeps the country culturally together. What constitutes "Canadian content" is of course a question of almost metaphysical proportions. Since Canadian cultural traits are not that dissimilar to American ones, especially as far as English Canada is concerned, Canadian content on the media is an elusive proposition at best.

The situation is quite different as far as French Canada is concerned. Because of the natural barrier of language, the Québécois cultural identity is less threatened from the English Canadian one. There are authentic Québécois traits that can be amplified by information. This both strengthens the separateness of Québec's life-style and poses a challenge to national unity, at least on the cultural side of it.

In sum, the Information Society is likely to pose a severe and serious threat to the unity, identity, and sovereignty of the Canadian nation. In addition to the identity and unity needs, the Information Society will most likely profoundly alter the political equation: the balance of forces between competing pressure groups. The Information Society will probably affect the equation in three distinct ways:

- a) The trend towards industrial concentration is the result of the logic of decreasing costs. We have seen that horizontal and vertical integration makes sense, economically speaking. If the merger trend is allowed to proceed, enormous corporate giants will emerge controlling the various relay points of the central electronic highway. The resulting monopolies or oligopolies will wield enormous market and, by extension, political power.

If, in addition, the "carriers" operating the electronic highway also acquire a monopoly or oligopoly on "content", then the "totalitarian" version of the Télématique Scenario becomes very possible.

- b) The threat of excessive industrial concentration could lead to a matching threat of excessive state-control. A monopoly, if allowed to emerge, is nowadays immediately regulated by the state.

In addition to regulation in order to control monopolies, the state is likely to intervene more massively in economic affairs: because of the very nature of the information commodity: a quasi-public good, often difficult to "privatize" and inviting state intervention.

The effect of these two factors could be to create an over-regulated, over-bureaucratized, state-controlled system. A state-controlled central electronic highway is at least as potentially dangerous as a private one because of the increased scope for totalitarian control.

- c) Finally, the political process itself is likely to change. Informmediation will become a more important factor in electing governments than the objective worth of the candidates.

i) Media-image as a determinant of electoral victory or defeat.

- Already in 1960, it was said that Richard Nixon lost the U.S. presidential election to John F. Kennedy because of his "five o'clock shadow", embarrassingly visible during their televised debates. The importance of TV-image is now fully appreciated. On the whole, the media-image factor is a potentially distorting political reality.
- The introduction of television in the House of Commons has transformed politicians into performers, catering to the television viewers rather than to fellow-members of Parliament.

ii) The possibility of "instant referenda" and "direct democracy"

The technical possibility of instant referenda will exist when the interactive home terminals enter the average Canadian household. There are both positive and negative implications to this eventuality.

The positive aspect is the fact that instant referenda will allow more "direct democracy". Representative democracy via Parliament is theoretically second-best to direct democracy, which exists because it is inconvenient or impossible to consult the population over every issue. The negative aspect is that direct democracy may lead to populism and crowd-pleasing. In the British and Canadian democratic systems, it is Parliament and not the people which is endowed with sovereignty. This implicit mistrust of direct democracy is one of the reasons the referendum-system is the exception rather than the rule in British parliamentary tradition. When used, it has only a consultative effect.

So far in this paper, we have discussed the historical evolution (and lately, revolution) which has led to the emergence of the Information Economy. We have presented a view of what has been and is happening across the dimension of "time": we have talked about what might happen if one or another technology-mix is adopted and we have anticipated impacts on the society as a whole, or a collective. But we have, as yet, made scant mention of potential effects on people, as individuals, for whom, after all, the technology and the society itself exist. If the past two hundred years have a lesson to teach, it is that we cannot judge configurations of machinery solely on aesthetic or efficiency standards.

It can probably be safely assumed that the only generally acceptable moral or ethical (rather than economic or politically expedient) basis for assessing scenarios such as we have presented is "the good of the people". Of course, it is not as simple as that: two questions, "which people?" and "what good?" immediately present themselves. In other words, for what "unit" of social organization and by what criteria should we estimate the costs and benefits of "informediation"? There are several units which could have been chosen for consideration. The family, as the traditional unit of social organization, is an obvious choice but is presently undergoing too many and complex structural changes to be considered as a stable 'unit.'

The neighbourhood, the village, the municipality, the province, the region, are also important units which, no doubt, will be discernibly affected by the advent of "informediation". In Canada, however, ethnic urban/rural, provincial and regional differences are such as to forbid analysis on the basis of any of these as common units. Another reason for not choosing units which depend on interpersonal or geographical relationships for their maintenance is the possibility that these may themselves be changed by the phenomenon under consideration. By far the greatest and potentially most enduring commonality is found in the psychological and physiological make-up of the individual inhabitants, at least insofar as they are the beneficiaries, if not creators, of government and corporate policy. The advantage of choosing the individual as a "unit" for initial study is that we can retain that unit as common within any group selected for further investigation.

The changes potentially to be wrought by informediation with other "development" phenomena leave only the individual as a stable unit for consideration: and we must limit even "the individual" to the "individual as a member of the society", i.e., insofar as he or she has characteristics common to all members of the society. (Uniqueness itself may be taken to be a common characteristic). That leaves us with the question: which characteristics? The prime boast of all democratic societies is "equality of rights". That would imply that human rights, and in this case particularly, Canadian rights, should be the judgement criteria. Declarations of rights, however, tend to be defensive, after-the-fact documents created to protect implicit rights which have been violated or seriously threatened: this is the reason that

such documents, presently being drawn up, refer mainly to discrimination and violation of privacy. In Canada particularly, there is the problem of confusion and clashing between federal and provincial jurisdictions: notwithstanding the new Canadian Human Rights Act (1977), Canadians still do not have a common set of constitutionally entrenched rights.

Rights themselves are manifestations of commonly felt or expressed needs: we might say that they are "legitimated" needs. If we use established rights as judgement-criteria, we run the risk of ignoring common needs about to be threatened by the very phenomenon being judged. The rapidly increasing capacity for computer storage has generated great concern about privacy and access to information about oneself: microprocessors loom as a much-discussed threat to paid employment. Some work has been done in these areas but very little effort has been directed to discovering what happens, for example, to individuals who communicate largely with machines or with one another via machines; what happens to human relationships when verbal communication acquires a price? What happens to a territorially based and organized society when distance becomes less significant a factor in its passage of information? In other words, there has been small attention paid to the fact that while informmediation opens up some new avenues for satisfaction and frustration of needs, it also closes-off others. Even "basic needs", however, are by no means a simple set of criteria.

A great deal of research has been devoted during the past two decades to discovering what people "need". Human needs have been listed, categorized, classified and hierarchized, and nauseam, in an attempt to establish priorities for individual action, for community goals, for national public policy and for international aid and cooperation. The reason that so much time and energy has and is being devoted to understanding human needs is that dreadful blunders have occurred in even well-meaning attempts to banish want. It has been discovered that to give a month's supply of fish to a peasant rather than to teach him to fish is, at best, a stop-gap measure, which does not satisfy his need for the next month's fish or for this month's self-respect. No less, it has become obvious that a commodity which satisfies a need in one set of people does not necessarily satisfy the same need in another set of people.

Further, it is now understood that the configuration of wants (or active needs), even at the most elementary level of the individual, is a shifting, changing, inconsistent thing: no sooner is the person provided with food, shelter, clothing and security than he or she conceives desires for affection, self-respect and then "self-actualization". To complicate the matter, some needs become consciously-perceived "wants" in one person only when they are seen to be satisfied in another; "relative deprivation" is the popular name for that particular problem; it is a moot point whether it "creates" needs or merely stimulates wants.

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The attempt to describe human needs has naturally led to consideration of the "highest common factor", that set of needs which is experienced by each individual human being, independently of time, location, sex, age culture, or other variables. Individuals of course have additional specific needs: the diabetic, for example, may need insulin more than shelter. Public policy and corporate planning however must be guided primarily by needs which are common within the society. It has even been argued that policy decisions should answer to "social needs" as distinct from individual human needs.

Interestingly enough, in the context of "information", the only individual need which could be identified also as a social need is that for communications itself: the passage of information in a society does indeed take place in the connections among its individual members. It is only by communications between a society and its environment and among its members that the society is created and maintained. Concern which is often voiced in Canada over failures of national unity or national identity is a recognition of the society's need for a high level of intra-communications of certain types of information: only certain types, however. The social need is balanced by the individual member's opposite and reacting need for privacy: a person needs both communication and non-communication. Just as the individual requires this balance to exist autonomously within a society, the society, in the international context, needs both communications and "privacy". The change from the traditional to the Information Society is simply a new way of conducting the necessary passage of information.

We have, then, individual needs and a single, but vital, social need. Humans need things ranging all the way from the obvious and material "food, shelter and clothing" to such esoteric entities as Frankl's "meaning". Such is the arbitrariness of the standards by which needs have been investigated, interpreted and defined that there are as many proposed hierarchies as there are definitions of "well-being". Among the new attempts to clarify the situation is the work of philosopher Franz Oppacher (9). He has collated into a master list, excluding repetitions and items which appear only once, the hierarchies proposed by Maslow, Cantril, Malinowski, Tolman, Fromm, Linton, Thomas, Young, Montagu, Cattell, McDougall, Kurtz, Stagner and Karkowski. His idea was to mine the richness of the work (carried out since the nineteen-fifties) of these philosophers, psychologists and anthropologists so as to crystallize their agreement on the question, a sort of Delphi in retrospect. Where perhaps no one is right, they all, in unison, might be right. The "law of large numbers" may well apply to social scientists because the result of the collating, seven sets of related needs ranked by prepotency, is very difficult to refute. Emphasizing that such a hierarchy can never be anything more than tentative, it can be presented briefly, as in the following table 6.

9) Oppacher, Franz. "Philosophical Dimensions of a Conserver Society: Quality of Life", in: Values and the Conserver Society. GAMMA. 1976

TABLE 6

| <u>SETS OF RELATED NEEDS</u> | <u>SOME CORRESPONDING SATISFIERS</u> (author's notes) |
|---|---|
| 1) Physiological/ Maintenance | Food, shelter, clothing, water, air, absence of pollution. |
| 2) Physical security | Freedom from illness, injury, attack. |
| 3) Psychological security | Stability, freedom from anxiety, powerlessness. |
| 4) Love/Belonging/ Cooperation | Identity, sense of community, emotional attachments, absence of alienation. |
| 5) Self-respect/Personal dignity | Worthwhile long-range goals, job satisfaction. |
| 6) Self-actualization/ Growth/Competence | Novelty, increasingly complex skills, creative activity. |
| 7) Understanding/Purpose | Order, meaning, understanding, information. |

If we are to approach an understanding of the social effects of "information", we must first examine the activities by which needs are satisfied. In a modern industrial society like Canada's, individuals pursue satisfaction of most of their needs in an indirect fashion: by division of labour, remunerated employment and payment of services, we largely give over to others the tasks which sustain life and happiness. That means that virtually every individual is a beneficiary of many activities in which he is not directly engaged. A radical change in the way these activities are conducted carries with it the promise of threat in the satisfaction of his needs. Assuming the availability of technologies upon which pivot our eight scenarios of information (introduced in section B), each and all of the societal activities listed in the following table will be intermediated, i.e., the processing, storage and transmission of information concerned in these activities will be partially or wholly mediated by technological devices (including those already commonplace).

These rough divisions of activity in Canadian society are chosen because they satisfy three essential conditions: each category will probably employ a different technology-mix: the information of each category will have an impact on need satisfaction differentiable from that of the others; and each is amenable in a different way, or to a different extent, to control or influence.

What we want to discover is: will further technological mediation of information within these activities impact positively or negatively on the satisfaction of needs in Canada? Or to what extent is it socially desirable? We can create a format for components of an answer to this question by constructing a matrix (Figure 2) with columns representing activities (from Table 7) and rows representing sets of related needs (from Table 6). The upper left half of the "boxes" thus formed depicts satisfaction of needs, the lower right half, frustration of needs.

The expression "components of an answer" is used advisedly since this is a highly reductionist approach which would require a synthesis of positive and negative impacts before priorities could be set. However, whether the whole picture of information is judged to be socially desirable or not, it is as well to know in advance the probable social consequences of decisions taken perhaps for economic or political reasons. One observation more on the reductionist technique:

TABLE 7

SOCIETAL ACTIVITIESBRIEF CLARIFICATION

- | | | |
|---|---|---|
| 1. Production, Distribution (of material goods such as food, shelter and clothing). | - | Includes exploration and development of resources, manufacturing, storage, transportation, distribution, wholesale, and retail in which computerization, telex, viewdata and microprocessors are used. |
| 2. Service (information-intensive but providing primarily non-information commodities). | - | Includes government services, banking, insurance, credit cards, professional services in law, medicine, etc. |
| 3. Advertizing | | Includes 'print' radio, television, videotex |
| 4. Education and useful information | - | Includes 'informative' cable and network television and radio broadcasting, non-fiction books, journals, videotex-plus, pocket calculators, teaching machines, etc. |
| 5. Entertainment | - | Includes 'entertaining' broadcasting, stereos, tape recorders, books, film, electronic games and microprocessors. |
| 6. Interpersonal communication | - | Includes telephone, mail videotex-plus, CB radio, tele-conferencing, but also "bugging" devices. |
| 7. International aspects | - | Main impact differentiable from domestic aspects, is probably by the Information and Entertainment channels as in 4 and 5 above. However, since such a large proportion of our 'domestic' industry is foreign-owned, channels 1, 2 and 3 are also relevant. |

GUIDING MATRIX FOR IDENTIFICATION OF THEMES FOR IMPACT STUDIES ON SOCIAL COSTS AND BENEFITS OF INFORMEDIATION

| SOCIETAL ACTIVITIES | | | | INTERNATIONAL ASPECTS | | |
|---------------------------------------|---|--------------------------|--|-------------------------------------|-------------------------------------|--------------------------------------|
| RELATED SETS OF NEEDS | PRODUCTION & DISTRIBUTION | SERVICE | ADVERTISING | EDUCATION OR USEFUL INFORMATION | ENTERTAINMENT | INTERPERSONAL COMMUNICATION |
| Physiological maintenance | Availability of goods/ labour saving Physical safety | Convenience Security | Knowledge of goods & services. Over-consumption | | | Clinical effects Clinical effects |
| Physical security | | | | | | |
| Psychological security | | | | | Escape from problems | |
| Love/belonging cooperation | Alienation | | | National unity National identity | National unity National identity | Friendship |
| Self-respect/ Personal dignity | Unemployment | Independence | Relative deprivation | Achievement | | |
| Self-actualization/growth/ competence | Unemployment | Learning skills by doing | | Learning new skills | | |
| Understanding/ purpose | Alienation | Knowledge | | Knowledge | | |
| Devices employed | C X T M | CXT MVRO | V R P F O T H | V R P F | F R P F S E M | T O B H |
| C - COMPUTERS | V - TELEVISION | | | E - FILM | | |

S - STEREO, TAPES
 E - ELECTRONIC GAMES CALCULATORS
 M - MICRO-PROCESSORS
 H - HOME COMPUTER TERMINALS

F - FILM
 O - POST OFFICE (MAIL)
 B - BUGGING DEVICES

V - TELEVISION
 R - RADIO
 P - PRINT

C - COMPUTERS
 X - TELEX
 T - TELEPHONE

there is a good case for suggesting that only social scientists and decision makers perceive or have any interest in categorization of needs, or activities that people know better in a diffuse, undifferentiated fashion how much they like something than they know why. While some changes, current and imminent, in the physiological and psychological health of a society's members can be inferred from objective data, complementary subjective responses (through sampling) would be needed to complete the picture.

The following section demonstrates the use of the matrix and probes the problématique at selected points to indicate sub-themes for a "social implications" study.

2.2 Preliminary Assessment of Some Probable Social Costs and Benefits.

2.2.1 Production and Distribution of Material Goods.

Canadian industry is already highly informed: Computer automated machinery, telex and telephones are widely used at all stages of the production and distribution processes. One recent development, however, the introduction of micro-processors, is expected to have a more profound effect than all these three "traditional" technologies put together.¹⁰ Clearly, such a versatile and cheap technology has the potential to revolutionize the employment picture.

(10) Oppacher, Franz. Microelectronics: The New Technology, Department of Industry, U.K., 1979.

A paper produced by the Central Policy Review-Staff, a British government think-tank, attempts to argue that in spite of the myriad of possible applications, the silicon chip is not a major threat to employment. The paper indicates, as main impacts, improvement in quality and reliability, reduction of stock levels, savings in raw materials and energy, and development of improved services and product range. This may all be true but it is difficult to see how such salutary effects can be achieved unless the microprocessor efficiently takes over tasks such as testing, counting, measuring, assessing, calculating, presently carried-out more haphazardly by human beings. In other words, we might ask, as a basic question: why employ microprocessors except to replace human labour? The answer would appear to be outside the direct social and unemployment implications and to be based on the admittedly serious grounds of the perceived need to compete internationally and economically. Although the paper raises interesting points, it can scarcely masquerade as a policy guide concerning the social and employment consequences of microelectronics: the introduction lists the British government's activities in the field as: firstly, "encouraging the development of the semiconductor industry"; secondly, "promoting the application of microelectronics"; and thirdly (and lastly), "an examination of the employment and social consequences" (11). The policy decision is already made irrespective of these latter consequences.

(11) Central Policy Review Staff. Implications of Microelectronics. U.K., November 1978. Mimeo.

If Canadian policy decisions are to be based, even partially, on expected impact on need-satisfaction, several questions concerning the widespread use of microelectronics in industry must first be answered:

1. Which are the applications which will replace dull, boring, repetitive, even dangerous work and which are merely gimmicky? Which will allow appreciable quality improvement?
2. What are the energy and mineral depletion implications of such applications as "robotics"? Microprocessors may replace the "thinking human" element in many tasks, but also require the addition of non-human energy. Allied to that, what are the energy savings to be expected from waste reduction and increased efficiency? Is it possible to sell, buy or run out of silicon?
3. What prospects are there of unemployment, underemployment, reduced working day, week, season, year or life? What plans could be made for retraining, re-education, re-employment of those whose work would be taken over? What anticipatory adjustments can be made in education of youth?
4. What would be the psychological effects on those whose work is "modified" by the microprocessor? In order to work closely with a machine, one must become, to some extent, machine-like.
5. To what extent does the unemployed or underemployed person experience feelings of powerlessness, alienation, loss of "belonging" and cooperation, loss of personal dignity? What scope would there be for self-actualization, and sense of purpose?

These are some of the questions which should be answered by a study of the social impact of microprocessors on the production and distribution of material goods. Some of the same questions could be asked in relation to the "services" sector where word-processors, electronic funds transfer, teleconferencing, commercial viewdata, etc., are liable to have similar employment effects. It is interesting to note, in this context, a recent paper entitled "Les Conséquences

sociales de la bureautique, un scénario québécois" (12), which envisions the gradual changeover from "downtown office with secretary" to "suburban secretary-staffed text producing workshops" to "all-purpose home terminal" between now and 1995.

It should be pointed out that unemployment may arise not only in particular industries which adopt the microprocessor but possibly also from a falling-off in production of traditional information-related industries. A.R. Megarry, from the point of view of the industrial strategist, has asked what will happen in the long term to the two industries where Canada has achieved international stature - pulp and paper and business forms? (13)

2.2.2 Services

There are a number of different approaches which could be taken to using the matrix to focus on relevant social impact studies. We could, for example, isolate the highly diverse "services" sector and examine the probable impact of information on the practice of particular professions or occupations within it. One of the fears expressed concerning the advent of the cheap microprocessor is standardization and anonymity of paid employment. It would appear, however, that, informed by a microprocessor-equipped terminal linked to a central data bank, the individual may be able to perform, on his own behalf, many tasks which are currently carried out by "professionals". Indeed, if large numbers of active people become unemployed or underemployed, they may be inclined to turn to the do-it-yourself mode of providing some services.

(12) Métayer. Les Conséquences Sociales de la bureautique: un scénario québécois. Paris, Innovation, Communication, Structures, 1976.

(13) Megarry, A.R. Democracy in the Knowledge Society. 1978

Law

The impact of informediation on the judicial process could be considerable. Already, "do-it-yourself divorce" kits, class action suits, rental boards, small claims courts, and tariff appeal boards have demystified and popularized dealing with "the law". The addition of legal information at the fingertips whereby one can discover not only the law, but "precedence", from a push-button terminal may make lawyers, except in very complex cases, all but obsolete. Lawyers, after all, mediate between individuals and corporations and between individuals and legal governing bodies by virtue of the possession of encyclopaedic knowledge and awareness of procedures. One suspects that, in the vast majority of cases, with the appropriate information, the individual need not be "represented". He could deal directly with the dispensers of justice.

One could perhaps even envisage asking for "justice" via a teleconferencing technique giving references to documents recorded in a common data bank - or that even the human decision-making process could be by-passed with the computer acting as judge and jury, dispensing justice according to its recorded and stored precedence and the "facts" of the case. Could punishment for criminal offences become deprivation of freedom "to inform and be informed" rather than the freedom from movement outside four walls? "Isolation" in an information society could be solitary confinement in ignorance.

Medicine

These services are or could be information-intensive. We are liable to see, at last, the development of preventive medicine, something which would be in the logical sequence of development after nineteenth-century public health amelioration. Presently, there is a haphazard plethora of information, mostly of the warning kind, and without any standards of reliability. What is needed, and is possible with wide dissemination and computerization, is a simple, well-structured body of information on nutrition, health hazards, symptoms, preventive cures with scientific documentation. Health could become part of the individual's general knowledge, an integral part of the education curriculum. The old Chinese custom of paying the physician while one is well and ceasing to pay at the onset of illness was

recognition that medicine should be preventive and not a technique for occasional crisis management. Preliminary diagnosis can be carried out by computer, perhaps even through a home terminal, with the human doctor giving a second opinion. The surgeon's job, to deal with the inevitable failures of the system and with accidents, would not become obsolete but could become easier as the result of vital body signs being monitored by highly accurate devices equipped with microprocessors.

Religion

Religion, by its very nature, is a commodity which lends itself to "informationation". Already, electronic evangelists minister and administer profitably to the spiritual and probably emotional needs of millions.

The question is: will the established institutions respond to that challenge by taking advantage of the ever-increasing array of information facilities? A link-up, for example, is possible between a church leader speaking occasionally on the national network and the lesser clergy ministering by cable or rebroadcasting facilities at the local level. Videotex could be used to provide religiously based advice and texts and, linked with "electronic funds transfer", could also "take up the collection". Incidentally, the making and taking of pledges, donations, etc., for any purpose would be greatly facilitated.

Political Organization

If interactive electronic media span the country, the already diminishing justification for parliamentary constituencies being geographically based will be further reduced. Already, in order to fulfill a mere formality, candidates are "parachuted" into ridings with which they have had no previous experience or association. The personnel attached to political parties are shuffled and even the ridings themselves are "reorganized" to conform to some appearance of "geographical representation", which nobody takes very seriously. To some extent, in Canada, although more so in the United States, consumer advocates like Ralph Nader are, in effect, lobbying for widely dispersed interest groups.

Just as the territorial division of constituencies is eroding, the centre/periphery relationship itself is undergoing change by informmediation. Referenda, already becoming indispensable for major issues, would be facilitated by a technology like videotex and could be employed to aid in policy decision-making on lesser matters, thus by-passing the local representation by Member of Parliament. Broadcasting of parliamentary proceedings subjects to scrutiny the sometimes obscure nature of actual political differences among parties; television demands a new kind of "performance", personality and perhaps even politics. We may eventually see the present two-party system giving way to representation of interest groups which are presently only locally organized, at least for effective action. If access to interactive narrow-band broadcasting becomes a reality, women, the elderly, youth, the ecological left, ethnic groups, consumers of certain commodities and other such groups may become aware of common needs and the political power to pursue their satisfaction.

International communications have already made possible some degree of cohesion of interest groups, such as the recently formed federation of indigenous minorities gathered from Canada, the U.S., Australia, Africa and Asia. Representatives of activist groups do not hesitate to cross borders to protest activities like the seal hunt in Newfoundland.

The demotion of "physical proximity" as the prime determining factor in formation of groups, even in areas distinct from politics itself, is an extremely demanding and complex

question basic to an investigation of informmediation: the formation of non-territorially-based constituencies certainly merits a study of its own.

These professions or occupations, of course, do not fill the "services" sector but the foregoing brief discussion of the possible effects on them of informmediation perhaps illustrates the profound social impacts to be expected.

2.2.3 Education

Education is already undergoing rapid evolution, if not revolution. The many diverse attempts to establish lifelong learning systems via cable and network radio and television are manifestations of the demand for access to and control of ongoing education (14). The Open University of Great Britain, probably the prototype of advanced-level structured education via the mass media, has operated for several years with great success. UNESCO, in its attempts to furnish the developing countries with library and information systems, has discovered that information creates the demand for more information.

The smart home terminal linked to an omniscient data bank (or perhaps several specialized data banks) and furnished with lesson tapes and the "enquiry" facility would offer almost unlimited scope for continuing education, but even before that stage is reached, the classroom terminal will probably reduce the teacher's role. A gradual phasing-down to "guidance" and then "supervision" is probable but even the latter might become less necessary as, increasingly, mothers (and fathers) perform their "work", be it paid employment or otherwise, from home terminals.

(14) Rosen, Earl, et al. "The Community Use of Media for Lifelong Learning in Canada", in: Access: Some Western Models of Community Media. Frances J. Berrigan, ed., UNESCO, Paris, 1977. Pp. 85-143.

The education sector is extremely complex and liable to become more so as technologies develop, intermesh, and become widely available. Lifelong learning for personal satisfaction and enrichment and idiosyncratic education are concepts which should be studied in advance.

2.2.4 Interpersonal Communication

This "sector" is a difficult one to consider since a good portion of its content has traditionally belonged in the other sectors, production and distribution, services, advertising, etc. One of the major implications of informmediation, however, is the radical reduction of personal contact involved in these other sectors and its effective shrinking to what might be called "interpersonal communication for its own sake". The everyday encounters involved in work, in gaining an education and in seeking services of all kinds are liable to reduce for a large number of people, so that there may be a tendency to try to compensate in purely personal relationships. Since television is already seen as the villain in destroying conversation and, some say, even the family relationship, and since "hardware" would increasingly dominate the home scene, it is not easy to see where and how these personal relationships will be found.

The latter is a well-recognized problem associated with the mediation of information by technological means but there is another more insidious and perhaps more profound problem specifically associated with information acquiring a price. It will be argued that information is not like other commodities since, if A tells B something, B gains and A does not lose: he still has the information. Indeed, by transferring information, A probably gains prestige.

However, as information becomes an economic commodity, A will realize that it takes time and mental energy to tell B anything; that while A was acquiring the said commodity, B was acquiring another and A could have been doing likewise. If A has actually paid a sum of money, through Videotex or whatever, he will surely be conscious of the price which he has paid and B has not. Moreover, he will become aware that his own storage, processing and transmission capacity or some of these (hooked or unhooked to a terminal and perhaps a central data bank) has limited capacity; in all probability, he will conceive of himself as losing if he allows this capacity to be utilized freely on behalf of B.

Paradoxically enough, as a commodity becomes widely available and sufficiently dominant in an economy to become, for example, "the life-blood of a nation", it contemporaneously becomes scarce to individuals or groups within that nation. Presently, it might be said, we have something between an information-barter and a free-information society. People give one another data about the time, the weather, the location of lost people, places, objects, about how to operate machinery, about personal feelings, opinions - all manner of things. Some of this is on a rough exchange basis depending on the level of personal involvement, some is on a free-gift basis - but will it always be so? As it becomes clear that information such as "how one enjoyed one's summer vacation in a distant country" could be sold to that country as an exclusive input into its data bank; perhaps when the question "How was your vacation?" is asked, the answer will be "No, I'm afraid I've sold that", or "A copy will cost you ten cents."

The implications, if this becomes even only partially true, for interpersonal communication are overwhelming. One eminent scientist in the field has expressed as an advantage of the information utility the probability that individuals will apply less to one another and more to data banks for information, the latter being "more reliable" (15). They may do so also because the economics of the situation will intervene between the individuals. What will happen to interpersonal communications? Will we revert to tactile communication, a mode which is not readily utilizable by the information system? Will we take refuge in "higher" modes such as extra-sensory perception?

(15) Licklider, J.C.R. "Social Prospects of Information Utilities", in: *The Information Utility and Social Choice*. H.Sackman and Norman Nie, eds. New Jersey, AFIPS Press, 1970. P. 17

There is another long-term but important psychological and social implication of information or indeed any major change in the way a society's members mind their business: a new standard of normalcy and therefore a new set of deviations from it. Interacting with "thinking machines" requires a different set of skills from those involved in independent thought and interpersonal communication: some people are better at using a pocket calculator than they are at mental arithmetic; and others, vice-versa. What we must expect, in the long run, is a new notion of "intelligence" and the lack of it, and correspondingly, a new set of handicaps.

The most fundamental question concerns the human brain which is, after all, our last resort if we run into trouble. Could the individual mind, as the intersection point of many electronic highways, become effectively jammed and deprived of working space.

D. CONCLUSION

The emerging Information Society is a mixed bag of opportunities and threats, some offering great promise, others ominous and menacing. The Information Society is at the same time Prometheus, god of fire, Hermes, God of science and invention and Pandora's box. A full inventory of its implications spans at least four fields: economics, socio-politics, ecology and, ultimately, philosophy and eschatology.

In this paper, we have focussed merely on one such dimension, but a very large one, that of social costs and benefits, including both individual and collective needs and their satisfaction or frustration. An important research priority stems from this preliminary investigation because the changes brought by tele-informatics are probably at least as important as those engendered by the first industrial revolution - and we all know the immense structural changes that event triggered. The difference is that whereas the industrial revolution of the eighteenth century was intellectually discovered ex post facto, by scholars of the late nineteenth century, we have the good fortune to be aware of the magnitude of the changes as they are occurring. Let us not squander this opportunity for intensive self-study of our changing social order.

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Abbe Mowshowitz

INTRODUCTION

The general purpose, electronic digital computer appeared on the scene in earnest merely three decades ago. UNIVAC I, the first production model computer in the world (manufactured by Remington Rand), made its commercial debut at the United States Bureau of the Census in 1951; Great Britain launched commercial production of computers in 1952, Germany in 1954, and France in 1956. [17] Since the early 1950's computer technology has advanced rapidly and computers have become seemingly indispensable to the organizational life of the major industrialized countries. The computer industry has reached gigantic proportions with sales in excess of \$30 billion annually. American computer companies and software firms reported gross revenues of more than \$36 billion in 1978. [1] In 1977, the worldwide installed base of systems produced by these companies included 182,000 general purpose computer systems and 325,000 mini and dedicated application systems, valued at roughly \$100 billion. [16] These statistics give some indication of the social significance of computer technology. The extensive use of computers in all sectors of society confirms the statistical picture.

The earliest uses of computers were in scientific research and development in government operated or supported laboratories. Apart from its application to the tabulation of census data, the computer's first employment outside the laboratory was in the financial world. Banks and insurance companies were among the first commercial enterprises to recognize the computer's potential as an information processing device. Now it is hard to find an industry, business, government agency or service organization that does not make use of computers. Computerized transaction processing for payroll, billing, receipting, service claims, etc. is extremely widespread. Computers are used to control industrial processes, and to automate complex machine-operations. Government and corporate records are processed by computers, and communications is heavily dependent on computerized switching systems.

Despite the industry's non-trivial contribution to GNP and the widespread use of computers, it is presumptuous to speak of a computer revolution. Computers have not revolutionized the structure of organizations, nor have they effected significant changes in our political life. Other products of technology, such as the automobile and nuclear weapons have had a far more dramatic impact. For example, the automobile industry accounts for a much larger percentage of GNP than does the computer industry, and the effects of automobile transport on living conditions are much more evident than those of computer applications. Yet this new technology seems to excite more than its share of social and political concern - indeed we may be witnessing the emergence of a new academic discipline devoted to the study of the social impact of computing. [8] What is all the fuss about?

The computer is a relatively new addition to our technological armamentarium, but novelty alone does not account for the concern and controversy computer use has engendered. Computers are information processing devices and thus are linked, as instruments, to organization and knowledge. What may distinguish computing from other technologies is the special relevance to the former of Bacon's dictum "Knowledge is power". The use of computers by organized groups could contribute to changes in the forms and loci of social control. [21] This potentiality of computer use informs much of the discussion of social issues in computing, a

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discussion which springs mainly from the need to resolve public policy questions concerned with computer technology.

Public policy debates on the use of technologies, no matter how urgent or intense, do not in themselves warrant sustained research on the sets of issues they raise. Such continuing intellectual effort, with the supporting infrastructure it requires, is not likely to materialize unless the following three conditions are met. First, the technology in question is socially significant and is likely to have continuing policy implications, i.e. it is widely used, touches a broad spectrum of individuals and groups in society, involves substantial investment of social resources, and demands considerable adjustment in social institutions for its development and use. Secondly, its development, diffusion and use are sufficiently complex and unique as to require the elaboration of concepts, theories and analytic methods that are peculiar to the study of the social relations of that particular technology. Finally, the study of the relationship between the given technology and society provides opportunities for broadening or deepening our knowledge of social phenomena or human behavior.

The first two conditions are satisfied by several technologies which are currently in the limelight. Medical techniques such as kidney dialysis, based on sophisticated devices, have generated exceedingly thorny problems of how best to utilize scarce social resources. The debate over the desirability of installing nuclear generating plants involves technical problems bearing on reactor safety and waste disposal, and raises social, economic and political questions of energy consumption, exploitation of resources, and living patterns. Yet despite their significance, urgency and complexity, these controversial issues do not appear to have served as rallying points for research on the systemic influences of technology on society. This circumstance may have something to do with the institutional settings in which these issues are examined, but the issues themselves are too narrowly defined to provide the kind of intellectual opportunity demanded by the third condition.

The policy questions surrounding the use of computers come closer to satisfying all three conditions. Computer technology is likely to have significant social consequences; the diffusion of computer applications involves complex organizational problems which challenge traditional theories of organization; and social issues in computing constitutes an intellectual arena rich in opportunities for studying evolving social systems.

A partial inventory of policy problems concerned with computer use should help to clarify this claim. Computers figure prominently in policy debates on automation, privacy, automated funds transfer, home computing, computer-communications, and micro-electronics. Controversy over the impact of automation on production, employment, job satisfaction, skill levels, leisure, etc. has been extended and intensified by the advent of computers. The substitution of automatic devices and control systems for human laborers poses complex policy questions which touch on everything from human values to organizational structure. These questions alone warrant sustained research activity.

The alleged danger of computerized databanks to individual privacy and autonomy has been vigorously debated since the middle 1960's. This issue revolves around the relationship between the individual and society, a theme which is also prominent in discussions of computer-communications. The use of computer networks (or utilities) raises questions about the nature of democracy and the role of citizens in the political process. Home computing is closely related to the issue of computer communications since the home computer will probably assume the form of a terminal linked to a network providing a variety of services. In addition to the question of citizen participation in politics, the prospect of home computing leads naturally to speculation about the revival of "cottage industry" and consequent implications for family life and work.

Automated funds transfer - a system of debits and credits based on electronic media rather than paper - is dependent on the elaboration of computer networks for financial transactions. This issue has obvious economic repercussions but it is also linked to the privacy controversy. Micro-electronics, one of the most recent additions to the list of policy debates, is partly an extension of the automation discussion since the spectre of unemployment resulting from widespread applications of micro-electronics is a major issue. But the concern over this rapidly developing technology also reflects the international character of the policy debates. National presence in the industry may be vital to the economic and political interests of individual countries.

This partial list of public policy issues shows the diversity and complexity of the collection of problems known as social issues in computing. What is more, it reveals the intellectual richness and social significance of the collection as an area of research. The major conclusion to be drawn is that sustained research on social issues in computing is justifiable on intellectual grounds, and is needed to provide the policy making process with a sound analytical foundation.

In what follows I will examine the current state of research on social issues, develop a weak classification of problems, and present some recommendations on research strategy.

FROM FOLKLORE TO SCHOLARSHIP

The way in which research on social issues in computing has developed is somewhat peculiar. Prima facie one would expect such research to be monopolized by social scientists. In fact this has not happened, despite some important early work by social scientists. [7], [13] Since the late 1950's, some isolated scholars from the social sciences have conducted research on the relationship between computers and society; but the main disciplinary bases for research in this area have been computer science and management science.

Although some technical knowledge of computing is essential for investigating the implications of computer use, such knowledge is quite clearly subordinate to the social scientific, intellectual content of the issues. Mechanical or electrical engineers may design voting machines, but electoral behavior is a problem in political sociology. The anomalous development of research on social issues in computing is, I believe, largely a consequence of the extremely rapid growth of computer applications and the urgency of the problems this growth has posed for policy makers in business and government. Faced with a new and perplexing technology, policy makers have naturally tended to call on the technology's high priests for advice.

The social climate of the post World War II period may also have been a factor in the peculiar development of research on computers and society. In particular, the example set by nuclear physicists, in publicly insisting that scientists should take responsibility for their work, appears to have pricked the consciences of scientists and engineers generally. As a result one finds computer scientists, geneticists, medical researchers, and others debating the merits of codes of conduct for their respective professional societies, and urging the introduction of university courses on the social impact of science and technology.

Whatever may be the specific causes, research on social issues in computing has grown out of the casual observations of various representatives of the world of computing. By "casual observations" I mean insights based on personal

experience and anecdotal evidence. Although the observers in question - computer specialists, managers, and computer users - have typically been promoters of computer technology, their pronouncements on questions of public policy and their concern for professional conduct have helped to make academic departments and government funding agencies more receptive to the need for systematic research.

In using the term "systematic research" I am optimistically anticipating the future. The clearest indication of a shift away from the anecdotal approach to knowledge is that now there are a few scholars who regard each other as specialists on social issues in computing. Workers in this field have yet to reach consensus on subject matter and are still quite uncertain about what research methods are appropriate. Nevertheless, during the past few years, systematic empirical and theoretical investigations have been launched, and the territory of social issues in computing is gradually being mapped.

The appearance of anthologies such as Taviss [24], Westin [28] and Pylyshyn [20] in the early 1970's marked a turning point in the development of this research. These collections of studies helped to delimit the issues, to focus attention on important problems, and to identify gaps in our knowledge. The more systematic and comprehensive investigations of Gotlieb and Borodin [6] and Mowshowitz [14] carried this formative process a step further by linking the effects of computers to broad social problems.

The creation of a new field of research is a social as well as an intellectual enterprise. Forums for discussion, vehicles for communicating research findings, and formal groups for maintaining contacts between scholars are indispensable to a sustained research effort. Most of the initiatives for supporting research on social issues in computing have been taken by computer specialists. Computer societies such as the Association for Computing Machinery (ACM) and the International Federation of Information Processors (IFIP) have sponsored conferences and related activities on this topic. The journal Communications of the ACM has created a technical department on computers and society, and new journals such as Telecommunication Policy and Information Technology in Human Affairs have been established by individuals from the world of computing. Formal groups dedicated to the support of work on the social impact of computing have also been created by professional societies in the computing field. The ACM has formed the Special Interest Group on Computers and Society and IFIP has established the Technical Committee on the Relationship Between Computers and Society.

This infrastructure now supports a growing community of scholars in North America and Europe. The community, despite the preponderance of initiatives based in the world of computing, consists of social scientists, managers, trade unionists and lawyers as well as computer specialists. Interaction between computer specialists and social scientists has increased, as evidenced by greater sociological sophistication in published work on social issues in computing.

Perhaps the major advance in research on this subject has been the steady replacement of unbridled speculation by hypotheses based on systematic empirical observations. For example, Leavitt and Whisler [12] predicted in 1958 that computers would reduce the autonomy of middle management and provide top management with the means for exercising greater control over organizational functions. This prediction triggered an intense debate on the question of whether or not computer use fosters centralization in organizations. Although a conclusive verdict has yet to be announced, the debate has stimulated a number of empirical studies of computer use in organizations. [15] [23] [24] This work has not only given substance to the discussion, but has also led to refinements in the notion of centralization itself. [2]

Another, closely related example is the discussion set in motion by a speculative paper by Downs [3] on computers in urban governments. Downs foresaw shifts in power from lower to higher echelons of urban bureaucracies. The challenge of this prediction was taken up by several researchers who have conducted surveys of computer use in urban government. [4] [10] The knowledge gained in these studies has led to the discovery of reinforcement politics and the distinction between power based on control over resources and power based on the use of information. [9]

Pure speculation and anecdotal analyses have not been eliminated from the discussion of social issues in computing, nor is it desirable to eliminate them entirely. However, our understanding has improved thanks to the growth of sound scholarship, a tendency which needs to be encouraged and supported.

TOWARDS A CLASSIFICATION OF ISSUES

Why try to classify the diverse issues associated with the use of computers? There are several possible answers to this question: 1) to stake out the territory of social issues in computing, i.e. determine its boundaries and distinguish it from other areas of inquiry, as a means of describing its concerns to "outsiders"; 2) to provide a scheme for a division of labor within the territory, one which might, for example, be used by funding agencies to assign research proposals to specialist committees for evaluation; 3) to identify classes of issues which collectively reveal a unified and coherent intellectual undertaking. These answers are clearly not mutually exclusive (nor do they exhaust all the possibilities). Indeed, successful completion of the program contained in the third answer would probably satisfy the others, and, what is more, would give direction to research on social issues in computing. My aim here is to illuminate the difficulties involved in realizing such a program.

The fact that there can be different answers to the question "why classify?" points up the importance of specifying the purpose to be served by a classification. A library catalogue which orders books according to size would be useless to most library patrons; but such an ordering might be well-suited to the needs of a book depository. Similarly, a classification of the social relations of computers, based on the cost or type of hardware in applications, would be less useful to scholars, concerned with privacy and autonomy, than to marketing managers, interested in identifying opportunities for selling computer equipment.

As indicated above, the purpose I have in mind, for a classification of social issues in computing, lies in its potential contribution to the definition of a unified and coherent intellectual enterprise. The ease of stating this purpose belies enormous difficulties in realizing it. Ideally one should like to manufacture a scheme with the explanatory and predictive power of the periodic table of the elements or the biological taxonomy of Linnaeus. Unfortunately, our present knowledge is unequal to the task - the organizing principles or rules which suggest themselves for use in forming the classes of a taxonomy are simply not very penetrating or illuminating.

Schemes for classifying social issues in computing invariably differentiate issues on the basis of methods for analyzing them or on the basis of the substantive questions they raise. The former criterion does not yield sharp differentiation since the same set of methods - survey, case study, simulation, historical analysis, and so on - may be applied to virtually all the questions of interest. The subject matter criterion might appear to offer better results, but here too there are serious difficulties.

Two approaches to subject matter classification have been tried: one based on socio-cultural categories, the other on types of computer applications. Neither of these approaches is very revealing. Schemes based on socio-cultural categories present more or less arbitrary collections of economic, political, social, legal and philosophical issues which appear to have some connection with use of computers. Taxonomies built on computer applications are even less satisfactory since the boundaries between applications (regarded as socio-technical systems) are continually shifting.

The main shortcoming of these approaches to classification is that they have not produced clear and consistent criteria for class membership. Unlike the system of Linnaeus, the classifications of social issues based on subject matter provide insufficient means for placing a given issue in one class rather than another. What this signifies is simply a lack of understanding of the organizing principles in this domain of inquiry.

The failure to develop clear and consistent criteria points to inadequacies in our understanding of the relationship between technology and society. If we adopt the naive view that particular technical innovations influence social arrangements and that these social arrangements, in turn, affect the innovations, we are constrained to choose between the subject matter approaches to classification described above. The naive view is attractive for its simplicity, but it is basically a microsocial interpretation of the relationship between technology and society and fails to capture mutual dependencies which derive from historical forces. More sophisticated interpretations such as the one embodied in Ellul's [5] concept of "technique" have been proposed, but none is entirely satisfactory.

One important reason for these difficulties is that we have no satisfactorily unambiguous definition of technology. This is especially troublesome in dealing with computer applications - it is a non-trivial exercise to determine the boundaries of a computer system. Are the organizational arrangements which support the design, maintenance and use of a system to be treated as ancillary social factors or as parts of the computer system itself? As Weizenbaum [26] has argued, large-scale computer systems are evolving entities whose inherent complexity and changing character may defy the understanding of the designers themselves. This observation, which derives in part from the transgenerational character of systems design, underscores the difficulty of achieving a definition of technology, since social organization is an integral part of technology.

The foregoing remarks are intended as a caution against unrealistic expectations, not as an expression of futility. A satisfactory, general purpose classification scheme is beyond our reach at the moment, but it is useful to draw up a list of issues. The list presented below contains a mixture of socio-cultural and computer use categories which are attuned to current research on social issues in computing.

CHARACTERIZATION OF THE ISSUES

The ten topics in the following list encompass most of the issues which have been aired in the "computers and society" literature and in public policy debates. Also included are some issues which have not received much attention. The brief characterization of topics presented below is not meant to be an exhaustive inventory; my intention is to highlight what I consider to be the most important issues. More detailed discussion with citations to the literature can be found in [6], [8], [14]

1. Computers and record processing

This topic includes the highly controversial privacy issue which has received so much attention since the middle 1960's. The focus of research on this issue has been the problem of regulating the collection, processing, and dissemination of personal information in computerized databanks so as to protect the rights of individuals. A large number of government sponsored reports as well as academic studies have been produced on this subject, and several Western countries have enacted legislation based on the principles of "fair information practice" developed by Westin [27] and others.

The tenets of fair information practice are:

- a) An individual should be notified about the existence of and have access to information files containing personal data about himself, and should be able to add to, delete from, or amend such files.
- b) Personal data in computerized record systems should be used only for explicitly authorized purposes, and permission should be requested from data subjects for any other uses.
- c) Personal data systems should be established only for socially legitimate purposes.

These tenets are now widely accepted and have in varying degrees been implemented in legislation in Sweden, the United States, West Germany, Austria and Canada.

The legal-regulatory-security (or procedural) approach which underlies the idea of fair information practice has unquestionably dominated research on privacy, but there are dissenting views. There is no disagreement about the need for privacy protection legislation, but scholars such as Rule [21] and Mowshowitz [14] have urged consideration of the wider social and political implications of personal data management systems. The dissenting position centers on the claim that such systems further the ends of bureaucratic surveillance and thereby constitute a growing threat to the autonomy of the individual.

2. Computers and mass communications

The marriage of computers and communications is one of the most socially significant technological developments of the post-war period. Networks of geographically dispersed computer systems linked to each other by data transmission facilities and accessible to users from remote terminals may have far reaching effects on financial transactions, politics, work and family life. Electronic funds transfer systems, instant plebiscites, modern style cottage industry, and a diversity of home computing services can be implemented by means of computer networks. The evolution of these networks invites comparison with the growth of the telephone system: local and regional networks are likely to be consolidated or interlinked to provide national and international networks.

The technical feasibility of computer networks has been established by various experimental systems, most notably the ARPA network in the United States. Now there exist commercial and governmental networks in most of the industrialized countries. The rapid growth of networks and services poses urgent policy questions concerning the participation of stakeholders, public access, and services to be provided. Indeed, one observer (Press [19]) has argued that a moratorium on development should be imposed to allow time to consider the problems of regulation and access and to explore socially desirable uses of the technology.

One of the most contentious current issues associated with computer-communications is the impact of information flows across international borders. At stake are questions of national sovereignty and payment balances between countries. At the moment the United States and Western Europe are at loggerheads with the former pressing for free market arrangements, and the latter championing national controls.

3. Computers and the economy

The discussion surrounding computers and the economy is largely an extension of the controversy over automation that erupted in the 1950's. National income, employment and working conditions are the most prominent issues. There is still no consensus on the effects of computers on employment - the number of variables that must be considered makes it difficult to determine whether computer use results in a net increase or a net decrease in employment. This question has been given a new lease on life by developments in micro-electronics which some observers believe will intensify the process of automation because of the technology's applicability to service as well as manufacturing jobs.

Quality of working life and worker participation in decisions concerning the introduction and use of new technology are major issues for those concerned with computers in the work place. These problems are receiving more attention in European trade union circles than they are in North American labor unions.

The computer industry itself is a subject of research, mainly because of the dominance of a small group of American based multinational companies. Economic concentration may stifle promising new ventures and have an adverse effect on technical innovation. In addition, it is not clear that economies of scale automatically follow every increase in the size of an enterprise. The political implications of concentration in the computer industry are also an object of concern.

Fraud or theft involving the use of computers is a significant addition of the annals of white collar crime. No reliable figures on losses from computer crime are available because of the reluctance of victims to disclose the details of their misfortunes. Nevertheless, educated guesses (see Parker [18]) show this new species of crime to be a major problem. One of the aims of research in this area is to characterize the type of individual likely to commit fraud or theft by means of computers.

4. Computers in the service professions

The issues in this category could be distributed among some of the other topics, but they are sufficiently important to warrant separate treatment. Computer applications in medicine and education are already quite extensive. Applications in welfare (e.g. client tracking systems) and law (e.g. litigation support systems) are relatively new.

The main questions about the use of computers in medicine have to do with cost, availability, and quality of services. Promoters of computer use argue that greater reliance on paramedics and computerized diagnostic procedures would reduce costs, increase availability and improve the quality of health care services. This contention is the point of departure for a great deal of research.

Although computers are being used for administrative purposes in schools, the focal point of research on computers in education is computer assisted instruction (CAI). Systematic empirical studies of the impact of CAI on teaching

and learning are fairly rare - until recently most discussions of CAI were of the anecdotal or advocacy type.

5. Computers and organizations

The principal arena for computer applications has been the large organization, so it is not surprising that computers and organizations is one of the most active research areas in social issues. The major questions concern the effect of computer use on management and organizational structure. The computer's introduction into large corporations and government bureaucracies focused attention on the relationship between information and managerial control. After initial successes in computerizing routine data processing tasks, many managers and computer specialists succumbed to a wave of euphoria - computers were seen to be the ultimate management tool, capable of replacing all but the highest levels of management. MIS (Management Information System) became the management slogan of the mid-1960's.

During this period management scientists and organization theorists began looking for the effects predicted by Leavitt and Whisler [12]. In particular, studies were conducted which aimed at determining the impact of computer use on internal structure (e.g. departmentation) and on the roles of the different levels of management. Perhaps the major question raised in this research was the extent to which computers may contribute to centralization of control, i.e. to the movement of decision authority up the chain of command or the automation of management decision tasks.

The centralization - decentralization controversy has led to conceptual refinements. More sharply defined questions are now being investigated. The computer's effect on rationalization of functions, formalization of roles, routinization of task performance, and organizational responsiveness and vulnerability - issues that arose in the earlier discussions on centralization - are being examined by means of detailed case studies and surveys of managerial perceptions.

6. Computers and decision making

This topic could be merged with the preceding one, but some of the relevant issues - formal management tools, ethical judgement, the executive decision making model - carry the discussion outside the traditional organizational framework and thus warrant separate treatment. Simon's [22] analysis of organizations in terms of decision making activities has exercised a strong influence on approaches to the study of social issues in computing. This influence is especially evident in the attention devoted to the impact of formal management tools such as simulation and optimization techniques on organizational behavior.

The decision making model minimizes the ideological component in human choice by its emphasis on rational or quasi-rational processes. As a result, behavior is transformed analytically into a series of instrumental performances. This transformation is epitomized in the discussion of the potentialities of artificial intelligence (AI). To argue whether or not a decision-maker will someday be replaced by an intelligent program is to ignore the possibility of altering task requirements or of programming managers so as to render AI solutions superfluous.

The issue of information systems and ethical judgement is closely tied to questions about computers and organizations, but it also encompasses non-organizational settings in which individuals use computers. Central to research on this issue is the extent to which information technology affects personal autonomy and opportunities for exercising ethical choice.

The model of the service professional as executive decision-maker could be considered under computers and the service professions, but its conceptual dependence on the decision-making approach to organizations argues for its inclusion here. This issue concerns what I believe is a promotional attitude towards the use of computers - a vision of physicians, teachers and social workers as managers engaged in the mass production of services.

7. Computers in developing countries

The implications of gaps in computer technology between industrialized and developing countries has been examined by international organizations such as UNESCO and OECD since the early 1960's. Most of the research on this issue has been conducted from the point of view of the industrialized world, and has focused on the transfer of western technology to the third world. The inevitable distortions of this patronizing view are now being corrected as studies emerge from the developing countries themselves.

8. Computers and culture

This topic is as important as it is vague and diffuse. In the long run what Weizenbaum [25] has called the side effects of computer use, i.e. changes in attitudes, values and expectations induced by experience with the new technology, may very well eclipse the direct consequences that loom so large at the moment.

Obviously some of the issues are more well defined than others. Studies of the history of computing, surveys of popular attitudes toward computers, and investigations of the impact of computers on scholarship are examples of systematic research on the theme of computers and culture. The most actively pursued of these three areas of research is the history of computing. This area has received considerable encouragement from professional associations such as the ACM and there now exists at least one institute wholly devoted to the advancement of historical investigations.

The other issues on my list are only the most salient examples of the speculative concerns of representatives of the computing world. Artificial intelligence in particular has generated lively controversy on questions such as the computer's influence on man's self-image, and the roles of human beings in a highly mechanized society.

9. Computers in everyday life

This is a category of miscellaneous issues. Home computing and the hobbyist phenomenon are popular topics in academic circles as well as in the media. Since small, stand-alone computers are being purchased for use in the home, there is some justification for discussing the former issue apart from computer-communications. Home computing, in the form of a terminal linked to a computer network which

provides various services has also made its debut and will probably spread rapidly as costs decline and network services expand. This form of home computing is likely to become the dominant one. Much of the writing on this subject is of a promotional nature and concerns either what applications are feasible or the potential of home computing for economic exploitation.

The issue of humanization concerns the concrete problems individuals experience in dealing with computer systems. Research tends to be action-oriented in that its aims are:

- 1) to produce guidelines for development of systems that are responsive to the needs and desires of users, and
- 2) to correct or prevent irresponsible systems design.

Community initiatives refer to experiments in the countercultural use of computing to redress imbalances in information power. Several experiments with this aim have been conducted in the United States and Canada. If carried further they could yield insights into what should and should not be done with computer networks.

10. "Computers and Society" as an emergency discipline

I include this topic in the list to indicate that the study of social issues in computing has reached a critical stage in its development - a new discipline or subdiscipline may be in the making. Researchers are now becoming increasingly aware of the need for a critical examination of the subject and its methods. This is partly a consequence of uneasiness over the use of possibly unsound research in the formation of public policy, and partly a reflection of a desire for academic legitimacy. In addition to critical self-examination, researchers are beginning to push for the creation of academic programs, to lobby for research funding, and to solicit students in an effort to insure continuity in the field.

SOME RECOMMENDATIONS ON RESEARCH STRATEGY

Research on social issues in computing is an extremely demanding enterprise. First, the substantive issues are closely linked to public policy debates so that researchers have little or no insulation from the storms of politics - claims of clinical or objective detachment are at best reflections of obtuseness. Second, most of the issues cut across conventional academic disciplines, a fact which dictates a willingness on the part of scholars to extend their intellectual horizons beyond narrow specialties. Third, practical experience in the computing world, as well as critical intellectual skills, is indispensable for research in this area. Finally, the issues are unavoidably tied to fundamental questions of social theory, on which there is more controversy than consensus, thus requiring of researchers a high degree of intellectual fortitude. In short the study of social issues in computing demands ideological and intellectual fortitude, breadth, and worldliness.

Under what conditions can these formidable requirements be satisfied in practice? I do not believe there is one best solution for all times and places. It

seems to me that the most sensible course to pursue now is to encourage and support systematic and sustained scholarship wherever the intellectual resources and the will to conduct such inquiry may be found. As shown by the difficulties in devising a meaningful classification scheme, there are serious weaknesses and gaps in our understanding of the nature of the relationship between computers and society. Overcoming the weaknesses and filling in the gaps will require creativity, insight, and persistent effort. Where the work is done - computer science departments, trade unions, schools of public policy, management faculties, or social science institutes - is less important than how sound it is as scholarship and how much it contributes to our cumulative (as opposed to transient) knowledge. More than anything else we need to provide support for continuing research to allow individual scholars sufficient time to develop their ideas and to promote the formation of a research community with representatives from the worlds of computing, the social sciences and the humanities.

One institutional vehicle for accomplishing these ends might be a university based interdisciplinary research institute which can accommodate long term research projects and serve as a center for intellectual exchange. Fragmentation in the academic world has definitely hindered the development of working relationships and joint projects between computer specialists and social scientists. Every academic discipline has its own peculiar criteria of personal achievement, and attempts to satisfy the criteria of more than one at a time usually result in the failure to satisfy any. The working relationships between social scientists and computer specialists that have been formed in the past few years owe their existence in large measure to the creation of formal groups such as IFIP's Technical Committee on the Relationship Between Computers and Society. An interdisciplinary research institute could provide the support that is needed to make joint projects viable and productive. A university setting seems appropriate because the intellectual resources required by an interdisciplinary institute are not readily available elsewhere.

Given the dreary fact that there are limited resources for our various undertakings, it is necessary to confront the question of priorities. I have little hesitation in stating that sound scholarship should receive highest priority. Policy makers might argue that they need immediate answers to specific questions and that these questions should take precedence over longer term research concerns. The trouble with this argument is that it fails to take account of the disastrous consequences of changing fashions in policy issues. Variety is desirable but it is not an absolute good - too much leads to intellectual dissipation. If we are ever to escape the trap of "urgent problem - ad hoc recommendation - next urgent problem", we must make a commitment to the support of systematic research to provide a sound basis for judgement.

Our society's strategy for developing technology policy has been almost completely reactive in character. This means that we do nothing until market forces and technological drives present us with faits accomplis. Only then - when it is too late - do we begin to look at human and social needs. Our responses to radio, television, and now computer-communications have followed this pattern. The futility of Press' [19] call for a moratorium on development of community information utilities is a painful reminder of the inadequacy of the reactive strategy.

To realize a proactive strategy we must have the means to anticipate the consequences of alternative decisions on the use of technology, and the confidence

to act on our insights. Thus we must summon the courage to commit resources to basic research on problems that may have no immediate relevance to the policy questions of the day. By basic research I mean cumulative studies which are suggested by and can be integrated into a coherent analytical framework. Production of such a framework should be given high priority.

An ad hoc list is not an integrative framework - thus my emphasis on the problem of classification. To construct a framework we have to find principles by means of which we can order the issues according to structural or functional affinities. The periodic table of the elements and the taxonomic scheme of Linnaeus have predictive and explanatory power because they are based on essential features of the physical and biological realms. Two general features of the social realm which I believe could provide a basis for an integrative framework for research on computers and society are social control and equity (in resources and power).

These features are persistent themes in virtually all of the issues on my list. The social impact of personal data systems centers on the relationship between individuals, groups and the polity. At stake are 1) further shifts in the locus of social control from intermediate associations - neighbourhood, church, extended family, local union, etc. - to centralized bureaucracies, and 2) redistributions of power among various groups and individuals. Computer-communications raises similar questions about shifts in social control and redistributions of power. Insuring equitable access to the information resources of computer utilities is an especially prominent policy issue - information utilities could further disadvantage relatively poor and powerless groups in society or, through what Laudon [11] terms "citizen technologies", they could in theory provide mechanisms to promote the participation of such groups in political process. The use of computers as aids to rational decision making in large organizations may enhance managerial control at the expense of individual responsibility, and thus increase the power of central authorities over local communities. Both equity and control questions also arise naturally in examining the effects of information technology on employment and working conditions.

I believe that an integrative framework for research on the relationship between computers and society is indispensable to further progress. One way to begin building such a framework is to exact from each of the relevant areas of social analysis - history, economics, sociology, political science, social psychology, philosophy, etc. - formulations of technology-associated social issues which bear on equity and social control. Even if these themes or concepts prove inadequate for constructing an analytical framework, the exercise itself is likely to yield valuable insights into what further steps must be taken to integrate research on social issues in computing.

In emphasizing sound scholarship I am not advocating the creation of an ivory tower research program. On the contrary, it is precisely because of the pressing need to resolve socially significant policy questions that I dwell on scholarship - reliable knowledge is essential for the making of wise decisions, and support for continuing, systematic research based on sound scholarship is crucial for acquiring reliable knowledge.

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It is not much of an exaggeration to describe biomedical ethics as a contemporary academic Athene. Ten years ago the field did not exist; today it is a mature discipline, a product of the moral headache that technology has given society. Biomedical ethics contains a voluminous literature, including its own journals, bibliographies, and encyclopedia.¹ Myriad conferences, symposia, and workshops have been held on topics in the field, and several institutes have been founded to conduct research in the area. The discipline has attained academic respectability in the form of university and medical school courses. At the same time, the proliferation of newspaper articles on problems in biomedical ethics is a sign of widespread general interest.

This report is divided into three sections. Section I contains a brief introduction to and assessment of biomedical ethics. Section II surveys the Canadian contribution to the field, and Section III sets out recommendations for future research projects in the area.

I. The Status of Biomedical Ethics

The rapid growth of biomedical ethics is reflected in the theoretical disarray that exists in the field. A vast range of subjects are included under the heading of biomedical ethics, but these subjects often are discussed in isolation. No overall conceptual scheme exists to unite these topics or to ground a coherent theoretical approach to them. In short, from a theoretical perspective biomedical ethics is a hodge-podge.

For teaching purposes two general approaches are adopted to attempt to structure the field. The most common is to divide the area into substantive topics. The following list is illustrative:

1. The Physician/Patient Relationship
2. The Concepts of Health and Disease
3. Confidentiality
4. Truth-telling
5. The Definition of Death
6. The Management of Death: Adults and Infants
7. Abortion
8. Prenatal Diagnosis and Genetic Counseling
9. Informed Consent
10. Sterilization
11. Organ Transplantation
12. Experimentation with Human Subjects
13. Allocation of Scarce Medical Resources
14. Behavior Control and Modification (e.g. use of drugs, electro-stimulation, and psychosurgery)
15. Involuntary Civil Commitment
16. Genetic Screening
17. Genetic Engineering (e.g. artificial insemination, in vitro fertilization, sex selection, embryo transfer, cloning)

18. Recombinant DNA Research

19. Health Care Delivery Systems

Given the variety of topics on this list, the absence of theoretical coherence in the field is not surprising.

The alternative approach attempts to identify common themes or issues that can be traced through a number of topics. K. Danner Clouser, for example, discusses three themes he sees as crucial to biomedical ethics: the boundaries of the "moral community", the importance of the status quo, and the value of life.² In Principles of Biomedical Ethics Tom L. Beauchamp and James F. Childress try to avoid a "disjointed" approach by concentrating on four principles that they regard as applicable to a host of problems: the principle of autonomy, the principle of nonmaleficence, the principle of beneficence, and the principle of justice.³

A theme that arises with respect to many topics is paternalism. Withholding information from a patient for the patient's own good is a paternalistic act, and the question of when, if ever, a physician ought not to disclose a diagnosis of a terminal illness to a patient has been debated extensively. But paternalism also can be an issue in the areas of involuntary civil commitment, behavior control, sterilization, informed consent, confidentiality, and the management of death. An example of paternalism from the latter category is a physician's arrogation of decision-making responsibility about whether a defective newborn ought to live in order to relieve the parents of the burden of making this decision.

The theoretical confusion in biomedical ethics is a result of a variety of factors in addition to the sheer number and heterogeneity of topics included in a typical textbook in the area. Five factors will be considered briefly.

1. The Interdisciplinary Nature of Research in Biomedical Ethics

Those who write in biomedical ethics fall into the categories of clinician and non-clinician. Clinicians, for example physicians, psychiatrists and nurses, generally publish in their own professional journals, and their articles are primarily descriptions of particular cases that raise ethical issues and discussions of practical resolutions of these cases. Non-clinicians, for instance philosophers and theologians, usually publish in their own professional journals, and they are concerned principally with arguments about how certain kinds of cases ought to be handled.

The reason for this division of labor is the cleavage between theory and practice that is perceived as a central feature of biomedical ethics. Daniel Callahan presents this view nicely:

The philosopher (or legal scholar, or theologian, or social scientist) normally assumes that the clinician, for all his other strengths, lacks the advantage of a systematic exposure to rigorous theory, normative analysis, and the ability to move from the concrete to the general. The clinician normally assumes that the philosopher, however well-read and elegant in argumentation, lacks a feel for, and exposure to, the realities and complexities of life, and most specifically what it means to deal with real patients.⁴

Good cooperative, interdisciplinary research, one obvious way of trying to span the gap between theory and practice, unfortunately remains rare.

2. A Failure to Integrate Conceptual and Normative Issues

The handling of many issues in biomedical ethics requires careful thinking about concepts. An obvious example is the concept of a person. It is commonplace to view the moral status of abortion as depending primarily on the resolution of the question of at what point a fetus becomes a person. Other examples are easy to find. The concepts of death, coercion, and paternalism can be difficult to apply. Is a person whose brain has ceased to function but whose respiration and circulation are being maintained artificially dead? Does it make sense to claim that prisoners live in an inherently coercive environment? Is a physician who refuses to perform a tubal ligation on a young, unmarried woman acting paternalistically? Moreover, whether there is a conceptual distinction between killing and allowing to die is relevant to the euthanasia controversy.

It would be difficult to impugn the virtue of conceptual clarity. Nevertheless, three questions must be raised about the role of conceptual analysis in biomedical ethics. First, how does one decide when an emphasis on conceptual clarification is a viable approach to a moral problem? Abortion springs to mind. Has the abortion controversy been advanced at all by concentrating on the question of when a fetus becomes a person? If not, what alternative approaches might be more productive? How does one know when conceptual clarification is a necessary prerequisite to addressing moral issues and when conceptual clarification merely deflects one from the genuine moral issues?

Second, what is the connection between conceptual and moral issues? There is a tendency to see the resolution of conceptual issues as determinative of moral issues. In other words, it is tempting to hold that if only one could get clear about the key concepts involved in a particular problem, one automatically would know what ought to be done. If a patient is brain dead, for example, there should be no moral qualms about disconnecting the respirator. If a prison is an inherently coercive environment, then prisoners cannot give truly voluntary consent to participate in medical experiments. And if a physician is acting paternalistically, then he ipso facto is acting immorally. This approach is misguided. Conceptual clarification at best sets the stage for moral inquiry. One always can raise the further question of whether a particular act of coercion or paternalism, say, is morally permissible.

Finally, what is one doing when one engages in conceptual clarification? When one asks, for instance, whether a person whose brain has ceased to function but whose circulation and respiration are being maintained artificially is dead, what kind of question is being raised? Is it a semantic question? A descriptive question? A scientific question? A normative question? What kinds of investigation would be relevant to deciding whether "brain death" really is death? What kinds of arguments could be advanced for and against the claim that "brain death" really is death? These methodological questions must be addressed before the enterprise of conceptual clarification makes sense.

3. The Variety of Normative Approaches Adopted

The diverse theoretical approaches used in biomedical ethics reflect the plurality of moral views held on any issue. Fairly well articulated and developed versions of a number of moral theories exist in biomedical ethics. Paul Ramsey, for example, is the leading representative of a theological approach to these issues.⁵ At the opposite end of the spectrum is Joseph Fletcher's situation ethics.⁶ Tom Beauchamp and James Childress appeal to moral rules or principles, although one of them is a rule utilitarian and the other is a rule deontologist.⁷ Howard Brody is a proponent

of consequentialism, but it is not clear whether he favors act consequentialism or rule consequentialism.⁸ George Kieffer's approach is based on an evolutionary ethic.⁹ Several other writers prefer the contract tradition in moral philosophy.

A further problem is that many of these issues have a significant legal dimension. Although moral discussions can be relevant to the question of what the law ought to be in an area, the moral and legal aspects of these issues must be kept distinct.

4. A Failure to Distinguish Questions

A description of a morally troublesome case may be presented for two reasons. One is to raise the question of what morally ought to be done in this situation. Cases that focus on the issue of whether an irreversibly comatose person ought to be allowed to die, or whether a retarded woman ought to be sterilized, or whether a severely depressed person ought to be hospitalized involuntarily are good examples. The search is for moral guidance. On the other hand, a case may have been handled in a manner that is clearly morally objectionable, and it is presented to point out what has gone awry and to seek ways of preventing similar outcomes in the future.¹⁰ The exposes of controversial research involving human subjects are good examples.¹¹

Even when the question clearly raised by a case is, "What ought to be done here?", three levels at which this question can be asked must be recognized: the pragmatic level, the theoretical level, and the policy level. These will be discussed in turn.

Concrete moral issues in medicine must be resolved by the parties involved, often under the pressure of time. At the pragmatic level the concern is with establishing a decision-making procedure or set of guidelines or standards for handling particular moral problems. The frequent question, "Who should decide?", is a request for a practical decision-making mechanism. The focus is not on the outcome of the decision-making procedure, that is, the actual decision that will be reached, but rather on the manner in which the decision will be reached. So when the question of who should decide is being debated, the argument is not about the relative merits of alternative decisions that are likely to emerge from different decision-makers, but instead it is about the characteristics of the potential decision-makers. Some characteristics will tend to disqualify certain parties. For example, someone may be too emotionally involved in the situation and therefore too subjective. Other characteristics will count in favor of certain decision-makers. For example, someone may possess technical knowledge and expertise that the others do not, or another may have to live with the consequences of the decision, whatever it is. As a result, proxy consent may be sought, the problem may be turned over to a committee, or a judge may be asked to intervene. At this level the exigencies of the situation are given primary consideration, and a decision must be reached in the face of moral skepticism, uncertainty, and controversy. Even if there is no clear moral answer, and serious disagreement about what ought to be done persists, a practical decision must be made. Stalling or deciding not to decide is itself a decision.

An alternative, and sometimes overlapping, approach is to formulate a set of rules, standards, or guidelines for decision-making. Sometimes the set of standards may do no more than establish a decision-making procedure or identify a decision-maker. Frequently, however, the standards go beyond this and impose substantive constraints on the kind of decision that can be made. The standards may not be so strong that they specify what decision must be made, but they generally will indicate what kinds of considerations ought to be taken into account and they may rule out certain decisions as morally improper. The best example is the extensive set of regulations promulgated by the Department of Health, Education, and Welfare in the United States for experimentation involving human subjects.¹² The Medical Research Council¹³ and the Social Sciences

and Humanities Research Council¹⁴ of Canada have dealt with the same problem but not in as much detail. Other examples worth mentioning are the discussion paper, "Options on Medical Consent," prepared by the Ontario Interministerial Committee on Medical Consent¹⁵ and the Consent Handbook, published by the American Association on Mental Deficiency.¹⁶ 355

The theoretical level is concerned with the justification of decisions about how to handle concrete moral quandries. Before the term "casuistry" acquired its pejorative connotations, this level would have been described as casuistry, that is, "that part of Ethics which resolves cases of conscience, applying the general rules of religion and morality to particular instances which disclose special circumstances or conflicting duties."¹⁷ The process of justification can proceed in two directions. One may have a strong feeling about what ought to be done in a particular situation and turn to moral theory for a rational defense of this position. Or one may be unsure about what ought to be done and turn to moral theory for guidance by selecting a particular moral theory and working out how it would handle the situation. With the former moral theory plays a purely justificatory role; with the latter moral theory plays a heuristic role as well as a justificatory role.

The main difference between the theoretical and pragmatic levels is the assumption, at the theoretical level, that it is possible, at least in principle, to identify a substantively correct decision or set of decisions for a given moral problem. Even if there is not a uniquely correct decision for every moral problem, not every possible resolution will be morally permissible. The function of a moral theory, then, is to pick out those alternative solutions that are morally permissible. This view might be called the "sieve" theory of morality. The set of practically possible decisions for a problem is poured through the moral sieve and only the (presumably smaller) set of morally permissible decisions emerges. The point is that morality imposes substantive constraints on the handling of moral problems. The concern at the theoretical level is with the merits of a decision, not merely with establishing a workable procedure for reaching decisions. Decision-making procedures, of course, can be discussed at the theoretical level, but in a different manner. The set of morally permissible decisions would have to be identified before a procedure for generating those decisions could be constructed. At this level an independent test exists for the adequacy of a decision-making procedure. A procedure is adequate just in case it produces all and only those decisions that have been antecedently identified as morally permissible. At the pragmatic level no such test of adequacy exists.

The difference between the two levels can be illustrated in terms of John Rawls' distinctions between pure procedural justice, perfect procedural justice, and imperfect procedural justice.¹⁸ With pure procedural justice there is no substantive criterion for a just outcome; all one has is a procedure that must be followed, and if the procedure is followed, whatever outcome emerges is just. Rawls' example of pure procedural justice is gambling. With a poker game there is no criterion for a just distribution of money at the end of the game. Given that the rules of the game are followed and no one cheats, the distribution of money at the end of the game, no matter how uneven, is just. With perfect procedural justice there is a substantive criterion for a just outcome and a procedure for achieving the just outcome. Rawls' example is two children dividing the last piece of cake. The criterion for a just distribution is that the two children should receive pieces of equal size. The procedure for reaching this outcome is to have one child cut the cake and the other choose which piece he wants. With imperfect procedural justice although there is a substantive criterion for a just outcome, there is no guaranteed procedure for producing the just outcome. The example Rawls uses is a legal trial. The criterion for a just outcome of, say, a criminal trial

is that all and only those defendants who are legally guilty should be found legally guilty. Unfortunately, mistakes are made, and sometimes a defendant who is guilty will be found not guilty, and even worse a defendant who is not guilty will be found guilty. One hopes that trials come close to producing only just outcomes, but one must recognize the fallibility of trials. For the purpose of comparing the roles of a decision-making procedure in the first two levels, the pragmatic level can be seen as analogous to pure procedural justice and the theoretical level as analogous to imperfect procedural justice.

The third level is that of public policy. Important connections exist between moral issues at all three levels, and moral considerations from the pragmatic and theoretical levels can be relevant to the formation of public policy. Nevertheless, new considerations come into play when the question is not what the best decision-making procedure is for a particular problem, or what decision is morally justifiable for a particular problem, but rather what social policy ought to be adopted in a particular area. Beauchamp and Childress make this point:

The same principles and rules that apply to ethical issues in biomedicine also apply to public policies regarding biomedicine. However, it is rarely possible to move assuredly from a judgment that act X is morally right (or wrong) to a judgment that policy X is morally right (or wrong) because of numerous factors such as the symbolic value of law and the cost of enforcement. Thus, the judgment that an act is morally wrong does not necessarily lead to the judgment that the government should prohibit it or even refuse to allocate funds for it. For example, it is possible to hold that sterilization or abortion is morally wrong without simultaneously holding that the law should prohibit it or deny funds to poor women who without government support could not have a sterilization or an abortion. Nor does the judgment that an act is morally acceptable in some circumstances imply that the law should permit it. An example may be found in debates about active euthanasia. It is possible to hold that some acts of active euthanasia where patients face uncontrollable pain and suffering are morally justified, and yet to hold simultaneously that the government should prohibit active euthanasia because it is not possible to design a law that would prevent abuses.¹⁹

One may be troubled by the aura of paradox that surrounds holding that even though abortion may be morally wrong, it ought not to be legally wrong, or even though a particular act of euthanasia may be morally permissible, all acts of euthanasia ought to be illegal. There is a strong tendency to feel that a moral judgment about an act made at any given level in society ought to be reflected by the moral judgments about the same act made at all other levels in society. In other words, if an act is regarded as wrong (or right) at any level in society, it ought to be regarded as wrong (or right) at all other levels in society. Rolf Sartorius has dubbed this kind of view the "reflection principle". According to Sartorius the reflection principle embodies the following claim: "Where an individual has correctly decided that he ought to do X, any higher-order judgment about his decision to do X or his actual act of doing it ought to license or approve of, rather than disapprove of or penalize, the decision and/or the act itself."²⁰ He argues, however, that the reflection principle can break down because different individuals playing different institutional roles within society will have to take account of different kinds of considerations

when they must decide what ought to be done. And Beauchamp and Childress point out that these considerations can be either practical or theoretical. The practical considerations include the cost of enforcing a law and the feasibility of enforcing a law. The theoretical considerations include slippery slope arguments and a general view about the proper relationship between law and morality. When one is considering whether to make an action illegal because it is immoral, for example, one must address the general question of whether being morally wrong is a good reason in itself for making an action illegal. The Law Reform Commission of Canada recently answered this question in the negative when it recommended that incest be removed from the Criminal Code.²¹ Should the same stand on the proper relationship between law and morality be extended to the moral issues that arise in medicine? If not, what justifies the intervention of society into these areas, especially through the vehicle of the criminal law? Might not the law be too blunt an instrument to introduce into the physician-patient relationship?

5. The Poverty of Modern Moral Philosophy

Contemporary analytic moral philosophy is incapable of dealing with or unprepared for issues in biomedical ethics in at least seven respects.

i) Contemporary normative theories cannot deal with decision-making under uncertainty. Virtually all medical decision-making occurs in the face of uncertainty. Consider, for instance, the plight of a pediatrician trying to determine the cause of developmental delay problems in an infant. The mother is an epileptic who took a number of drugs during pregnancy. Since the birth of the child, the mother frequently has been confined to bed, and consequently the infant has not received as much maternal care and attention as he should. Given ambiguous results from an EEG, the pediatricians probably will be unable to determine whether there is an organic cause for the child's problems, or whether the problems are entirely psychological and social. When moral problems are added to an unclear medical situation, the uncertainties are compounded.

An example of a moral decision that must be made in the face of uncertainty is whether an abortion should be performed when the pregnant woman has a history of Duchenne muscular dystrophy in her family and amniocentesis reveals that the fetus is a male. At present there is no pre-natal test that can determine whether the fetus has Duchenne muscular dystrophy. The most the woman can be told is that there is a fifty per cent chance that a male fetus will be affected. How does one decide what morally ought to be done when one knows that a normal fetus may be aborted? Would it make any difference if the likelihood of the fetus being affected were twenty-five or seventy-five per cent?

The only guidance that one gets from contemporary moral theory or rational decision-making theory is that probabilities should be incorporated into calculations of expected utilities. But then the problem of determining the relevant utilities arises. What utilities does one assign to the life of a normal boy and the life of a boy with Duchenne muscular dystrophy? This problem suggests another inadequacy in modern moral philosophy.

ii) Contemporary moral philosophy does not possess a plausible theory of value. There is no adequate account of the nature of values, the origin of values, the structure of a system of values, the process of value change, or, with the possible exception of utility theory, the role of values in moral decision-making. Many of the key issues in biomedical ethics concern the value of human life, whether it is mere biological existence or a life of a certain quality. When philosophers do address this question, it generally is in the context of legal compensation for death or disability, and it

becomes an attempt to assign some monetary value (generally based on potential earning power) to a life.²² Without a better understanding of values, many problems in biomedical ethics will remain intractable.

iii) Contemporary moral philosophy does not have an adequate methodology for testing competing moral theories. If one sees the problem of deciding between competing moral judgments as essentially a problem of deciding between the competing moral theories from which those judgments are derived, then one needs a method of assessing, at least in principle, the adequacy of moral theories. Unlike philosophy of science, where the appropriate criteria for assessing competing scientific theories is a central and much discussed topic, moral philosophy contains only brief and superficial treatments of this methodological problem. Beauchamp and Childress, for example, hold that moral theories should be evaluated in terms of internal coherence and consistency, completeness and comprehensiveness, simplicity, and complexity.²³ John Rawls' treatment of the problem is more sophisticated, but not much more extensive.²⁴ Rawls advocates the method of reflective equilibrium, according to which moral theories are tested against a person's considered judgments about what is morally right and wrong. When a discrepancy exists between a theory and considered judgments, the theory can be revised and the considered judgments can be modified or abandoned until a reflective equilibrium between the theory and considered judgments is established. Although this is a promising start, what Rawls needs in addition is a theory of error, that is, a theory that tells one when, in cases of conflict, the theory should be revised and when the considered judgments should be revised or abandoned.

iv) Modern moral philosophy does not satisfactorily explain the roles of reason and emotions or desires in moral decision-making. There are two respects in which this is true. The first is related to the problem of moral methodology and concerns the proper relationship between theory and experience. In what way, if any, should a moral theory or general moral principles be tested by a person's experiences, where "experience" refers to how a person feels or emotionally reacts to a situation. Daniel Callahan has raised this question: "I assume...that theory and experience should and do inform each other. But the critical question is if and when we have a choice (and often we don't) is to decide how and when to allow experience to affect our general thinking."²⁵ Suppose for example, that someone who a priori believes that electro-convulsive therapy is a cruel, barbaric practice discovers that he does not have the feelings of repulsion he anticipated when he watches ECT actually being administered to a patient. Should this evidence be relevant to an assessment of his theoretical moral views about ECT? If so, should it lead him to alter his moral views in any way?

The second point is that modern moral philosophy is founded on a superficial psychology of action. According to this simplistic psychology of action, if an explanation of an action is requested, the answer will incorporate two elements: the beliefs of the agent and the desires of the agent. So an explanation of why Jones got out of bed at midnight last night to raid the refrigerator will appeal to Jones' desire to satisfy his hunger and a host of Jones' beliefs such as that there was left-over turkey in the refrigerator. This psychological model of explanation assigns reason and desire to two distinct and mutually exclusive compartments. The only function that reason can serve is to assess the truth of beliefs. Reason, in other words, is relegated to deciding whether effective means have been adopted to realize a given end. The only role that desires or emotions can play is to provide motivation for performing the action in question. On this model rational considerations in themselves cannot provide motivation to act, and ends or desires cannot be assessed on rational grounds.

This dichotomy between reason and desire has led to the complete segregation of facts and values. The divorce of facts and values has, in turn, created the dilemma with which twentieth-century moral philosophers have been wrestling for years. There are two desiderata that these philosophers would like moral judgments to fulfill. On the one hand, moral judgments should be rationally defensible, and on the other hand, moral judgments should have an intimate connection with action. Morality, after all, is a practical discipline; one wants people to act on their moral judgments. If, however, moral judgments are exclusively rational (or, in the jargon of the philosopher, cognitive), then it seems impossible to explain how they can have any motivating force and thus any connection with action. But if moral judgments are exclusively emotional (or non-cognitive), then it seems that they cannot be justified or defended on rational grounds. The difficulty is to explain how both reason and desire or emotions can be built into moral judgments when these two kinds of elements are taken to be incompatible. The solution appears to be to abandon the traditional roles that have been assigned to reason and desire (and concomitantly the hard and fast distinction between facts and values) and to develop a more plausible psychology of action.

v) Modern moral philosophy does not account for the importance that moral considerations are commonly taken to possess. The prevailing view seems to be that when moral considerations conflict with other kinds of considerations such as legal, economic, or prudential considerations, moral considerations automatically take precedence. Moral considerations are regarded as overriding. Is this view correct? Is it reasonable to hold that a man should sacrifice his job, his career, and perhaps even his family in the interest of doing what is morally right?²⁶ Is one required to make large personal sacrifices to remain morally untainted? If one refuses to make these sacrifices, is one performing a morally wrong action? Is such a person morally blameworthy? If this view about the supremacy of morality is correct, why is it correct?²⁷

vi) Modern moral philosophy cannot handle practical conflicts between moral views. The most popular method of dealing with moral conflict is to appeal to a principle of tolerance and, in effect, ignore the conflict. In the context of the physician-patient relationship, however, this approach may not work. Suppose that a young woman requests a tubal ligation and the doctor refuses to perform it because he thinks no woman in her twenties ought to lose voluntarily the capacity to have children. Both parties will be able to act on their conflicting views if the doctor can (and is willing to) refer the woman to another doctor who will perform the tubal ligation. But if this scenario occurs in a rural setting where no other doctor is available, must the doctor perform an action that he thinks is morally wrong? Modern moral philosophy does not have a satisfactory answer to the question of whether the doctor must get his hands dirty.

vii) Contemporary moral theories are indeterminate. A widely held view is that biomedical ethics is simply applied normative theory. The proper way to deal with moral issues in medicine, in other words, is to take a moral theory such as act utilitarianism or Kant's categorical imperative and apply it to particular problems. Moral problems in medicine are no different from moral problems anywhere else, so the approach used elsewhere also should be used in medicine.

Regarding biomedical ethics in this way is, I think, the received view. Because it is flattering to moral philosophers and moral theologians who have toiled so long in ivory towers, it is easy to see why it is the received view. These same moral philosophers and theologians are doing much of the writing in biomedical ethics. The received view is, nevertheless, a myth. A word of caution is in order before explaining why

this view is wrong. To say that the received view is false does not entail that philosophers and theologians, among others, have nothing valuable to contribute to biomedical ethics. Indeed, I believe their contributions are vital, but not because they possess specialized knowledge of moral theories that others do not.

There are several reasons why it is incorrect to view biomedical ethics as simply applied moral theory. First, this view does not fit the facts. Theoretical discussions of problems in biomedical ethics invariably turn out to be eclectic; any given theory is strained to the breaking-point by the complexity of individual problems and by the range of problems with which it must deal, and eventually extra-theoretic considerations or arguments are introduced. The broad application of any moral theory becomes confounded by issues such as the nature of the physician-patient relationship, autonomy, paternalism, coercion, and informed consent, issues that in themselves or in their application are unique to biomedical ethics.

Two other reasons arise when the function of a moral theory is considered. It is not clear whether a moral theory is supposed to provide a decision-making procedure or algorithm for specific moral problems, or whether a moral theory only is supposed to indicate what kinds of considerations are morally relevant to a specific problem.²⁸ If the function of a moral theory is the latter, then biomedical ethics is applied ethics in a much weaker sense of "applied ethics" than is commonly understood. Someone might argue that moral theories really are intended to yield decisions for concrete moral problems, but that what decision follows from a theory often is uncertain simply because the facts of the situation are uncertain. Moral theories, in other words, are not intrinsically indeterminate. One must recognize that moral decisions are no different from any other practical decision. Almost any practical decision must be made in light of insufficient and uncertain information. Until one has an infallible crystal ball, one never can know all the consequences of alternative courses of action, and the best one can do is guess which consequences are most likely to occur.

The difficulty with the application of moral theories to problems in medicine, however, is deeper than a mere inability to predict the future. For some of these moral problems the theories are inherently indeterminate. Consider the issue of whether to treat an infection in a profoundly retarded newborn or to withhold treatment and allow the newborn to die from the infection. No universalizability test, which roughly would require one to imagine oneself in the position of the newborn and to decide whether one could accept the proposed action if one were to occupy that position, can handle this problem because no one knows what it is like to be profoundly retarded. Nor can act utilitarianism be applied because it is impossible to know the preferences of the newborn. Here the guidance that moral theory offers runs out. It is no accident that judges, in deciding so-called "wrongful life" cases, say that it is impossible to determine whether a child would have been better off not being born, because such a determination requires a comparison of the state of the child's present life with some defect with the state of non-existence, and such a comparison is impossible to make. In the case of Gleitman v. Cosgrove,²⁹ for example, the parents had a child who was born with birth defects because the mother had German measles during pregnancy, and the parents sued the doctors for negligence, alleging that the doctors had failed to inform them of the possibility that the child would be born with birth defects, and that if they had known of this possibility, the mother would have had an abortion. In deciding not to award compensatory damages on behalf of the infant, the court reasoned as follows:

The infant plaintiff is therefore required to say not that he should have been born without defects but that he should not

have been born at all. In the language of tort law he says: but for the negligence of defendants, he would not have been born to suffer with an impaired body. In other words, he claims that the conduct of defendants prevented his mother from obtaining an abortion which would have terminated his existence, and that his very life is "wrongful." The normal measure of damages in tort actions is compensatory. Damages are measured by comparing the condition plaintiff would have been in, had the defendants not been negligent, with plaintiff's impaired condition as a result of the negligence. The infant plaintiff would have us measure the difference between his life with defects against the utter void of nonexistence, but it is impossible to make such a determination. This Court cannot weigh the value of life with impairments against the nonexistence of life itself. By asserting that he should not have been born, the infant plaintiff makes it logically impossible for a court to measure his alleged damages because of the impossibility of making the comparison required by compensatory remedies.³⁰

Whether the decision is a legal one about damages or a moral one about the permissibility of abortion in such circumstances, the key issue remains the comparison. And no contemporary moral theory can handle the question of whether the infant would have been better off if he never had been born. Thus it is no accident that discussions of life and death issues in biomedical ethics, such as abortion and allowing defective newborns or irreversibly comatose adults to die, appeal to considerations such as the sanctity of life and the quality of life rather than to traditional moral theories.

Unfortunately, when traditional moral theory is abandoned, what one ends up with is not a new and better moral theory but instead a slogan masquerading as a theory. The invocation of rights claims, the distinction between ordinary and extraordinary means, and quality of life and sanctity of life considerations are examples of such slogans. Paul Ramsey has called such slogans "argument-stoppers" because one slogan always can be countered by another slogan, and the result is a moral stalemate.³¹ The worst consequence of moral sloganeering is that it forestalls deeper analysis of the moral issues. Even such apparently respectable arguments as an appeal to the protection of a person's autonomy or a reminder that a person always ought to be treated as an end and never as a means alone frequently turn out to be no more than slogans, at least in the context of biomedical ethics. No explanation of what moral autonomy is and how it can be violated or of what it means to treat a person only as a means is forthcoming.

To summarize, my contention is that the role of traditional moral theory in biomedical ethics is vastly overrated. The question one hears most frequently in this field is, "What would be in the best interests of the patient?" This is a different question from, "What would I want done to me if I were in the patient's shoes?" or "What action would lead to the best consequences for everyone affected?" The question about the best interests of the patient is raised because it seems to be the right question to ask and because traditional moral theories seem to flounder when they are forced to deal with real moral problems.

Why is contemporary moral philosophy in such distress? There undoubtedly are many reasons, but two stand out. One is the pre-occupation of twentieth-century moral

philosophers with meta-ethics rather than normative ethics, a trend that has been reversed only recently. The other is the use of oversimplified examples. Plato, for instance, discusses whether one ought to return a weapon that one has borrowed to its owner when the owner has become insane and now wants the weapon back to commit suicide. Kant's famous examples of the application of the categorical imperative concern suicide, borrowing money when one knows one cannot repay it, developing one's natural talents, and donating to charity. The issues of biomedical ethics are richer and more complex. They often are complicated by factors such as difficult risk/benefit calculations, the involvement of a number of parties who are playing different roles and who have different interests and perspectives, the fact that the person making the decision is not the person who will have to carry out the decision, and the likelihood that the decision will have widespread social repercussions. Moral philosophers simply have not appreciated the fullness of the contexts in which moral problems can arise.

Alasdair MacIntyre recently has offered another explanation of the defects in modern moral philosophy. MacIntyre believes that modern moral philosophy is inadequate because the analytic tradition in philosophy has transformed moral philosophy from a large-scale systematic inquiry into piecemeal analysis. He says:

...when we left behind us the ancient, medieval and early modern worlds, we entered a culture largely and increasingly deprived of the vision of the whole, except at the aesthetic level. Each part of our experience is detached from the rest in quite a new way; and the activities of intellectual enquiry become divided and compartmentalized along with the rest. The intellectual division of labor allocates problems in a piecemeal and partial way....The consequences for moral philosophy are clear; it reflects in its modes the society and the culture of which it is a part. It becomes a symptom rather than a means of diagnosis. And it is unable to solve its own problems because it has been isolated as a separate and distinct form of enquiry and so has been deprived of the systematic context that these problems require for their solution.³²

The remedy, according to MacIntyre, is to reestablish the systematic connections between moral philosophy and philosophy of causality, mind, and action, and political philosophy,

II. Canadian Activities in Biomedical Ethics

A. Conferences

A number of conferences in or related to biomedical ethics have been held recently in Canada. These include:

- Symposium on Ethics in the Treatment of Severely Defective Newborn and Young Children, sponsored by the Center for Bioethics, Clinical Research Institute of Montreal, Montreal, November 18, 1976.
- Symposium on Values vs. Rights: Decisions Affecting Developmental Disabilities, sponsored by Children's Psychiatric Research Institute, London, May 25, 1977.

- Colloquium on Biomedical Ethics, sponsored by the Faculty of Medicine and the Department of Philosophy in conjunction with the Faculty of Law, University of Western Ontario, London, October 27-30, 1977.
- Symposium on the Postponement of Death: Who Decides?, sponsored by the Center for Bioethics, Clinical Research Institute of Montreal, Montreal, October 26, 1978.
- International Conference on Controversies in Law, Medicine, and Health Care, sponsored by American Society of Law and Medicine, Northwest Institute of Ethics and the Life Sciences, and Children's Orthopedic Hospital and Medical Center of Seattle, Washington, Vancouver, February 22-24, 1979.
- Symposium on Death with Dignity, sponsored by the Department of Philosophy, University of Toronto, March 30, 1979.
- North-American Symposium on "Human" and "Person" as Normative Concepts in Contemporary Biomedical Decision-Making, organized by Mr. E. Keyserlingk, Law Reform Commission of Canada and Dr. David J. Roy, Center for Bioethics, Clinical Research Institute of Montreal, Montreal, May 10-11, 1979.
- Symposium on the Sterilization of Mentally Retarded Persons, sponsored by the National Institute on Mental Retardation in cooperation with the Ontario Association for the Mentally Retarded, Toronto, May 24-25, 1979.
- Symposium on Medical Advances Through Clinical Trials, sponsored by the Divisions of Continuing Medical Education, University of Alberta and University of Calgary, Edmonton, May 31-June 1, 1979.
- Conference on Challenges of Ethics and Human Values in the 1980's, sponsored by the Westminster Institute for Ethics and Human Values, London, September 27-29, 1979.
- Symposium on The New Genetics and the Future of Mankind, sponsored by McMaster University Continuing Education Series, The Royal College of Physicians and Surgeons of Canada, and the St. Joseph's Hospital Foundation, Hamilton, October 24, 1979.
- International Conference on the Legal and Ethical Aspects of Health Care for Children, sponsored by American Society of Law and Medicine, Canadian Institute of Law and Medicine, and Northwest Institute of Ethics and the Life Sciences, Toronto, October 25-27, 1979.
- Conference on The Severely Handicapped Newborn, sponsored by the Faculty of Law, Faculty of Medicine, and Department of Philosophy, University of Toronto, March 28, 1980.

he proceedings of the first two symposia on this list have been published (see 17 and 7 in Appendix A).

. Research Institutes

Two institutes devoted to research in biomedical ethics exist in Canada. The Center for Bioethics was inaugurated at the Clinical Research Institute of Montreal

on September 23, 1976. Its director is Dr. David J. Roy. The Center has five general objectives: raising the level of professional and public discourse on value conflicts in the contemporary practice of medicine; bringing interdisciplinary discourse to contribute effectively in shaping viable medical, hospital, and public policies on difficult ethical issues in our pluralistic society; clarifying the goals and balancing the priorities of biomedical research; sharpening societal long-term vision of the alternative possible applications of contemporary biomedical research and technologies; and integrating our scientific, philosophical and cultural notions of what constitutes genuine human development as a necessary condition for less fragmented and unbalanced programmes of biomedical service to human beings. Scholars working at the Center prepare articles for professional journals and for publications directed at a general audience. The Center publishes the proceedings of its symposia, and it is developing a French language publication on bioethics. Topics currently being investigated at the Center include sterilization of the mentally retarded, experimentation with human subjects, ethical problems in biostatistics, artificial insemination, pre-natal diagnosis, and ethical issues in the neonatal intensive care unit. In the future the Center plans to do research in the areas of mental illness (e.g. how people get incarcerated in mental hospitals and the use of electroconvulsive therapy and psychosurgery), models of thinking in medicine, the funding of research projects, peer review of research protocols, the allocation of scarce resources (e.g. CAT scanners), the distribution of special medical resources, brain death, and cryobiology.

The Westminster Institute for Ethics and Human Values began operation on July 1, 1979 at Westminster College in London, Ontario, under the direction of Dr. Michael D. Bayles. Its objective is to conduct interdisciplinary research and educational programs concerning ethics and human values. One area of research that will be emphasized initially is biomedical ethics. Among the specific issues which may be investigated are neonatal care of damaged infants, "artificial" reproduction, the relation of law to biological knowledge, the accountability of the medical professions, and ethical issues of an aging population.

In addition, the University of Calgary is establishing a program in biomedical ethics under the direction of Dr. Benjamin Freedman. Dr. Freedman's research interests include the theory of informed consent, treatment of anomalous patient populations, allocation of medical resources, and the organization of responsibility in the health care team. Future research projects in the program might include the modalities of presentation of bioethics to nursing staff, guidelines for experimentation with human subjects, evaluation of various procedures for obtaining consent from patients and an inquiry into alternative procedures, and the perception of the members of the health care team of their own and others' responsibilities (e.g. what tasks are seen as properly allocated to the surgeon performing a given procedure, to the family physician making the referral, to the anesthesiologist, and to the ward nurse?).

The Institute for Research on Contemporary Interpretations of Man at the University of Sudbury also conducts research in biomedical ethics. Its director is Professor Simon Davis.

C. Publications

The literature in biomedical ethics is voluminous. Fortunately, two superb bibliographies exist. One is the selected and partially annotated Hastings Center

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Bibliography of Society, Ethics and the Life Sciences,³³ which is revised annually. A more comprehensive bibliography is the Bibliography of Bioethics, edited by Roy Walters.³⁴ At present this bibliography consists of five volumes, and a new volume is published annually. The Canadian contribution to this vast literature, unfortunately, is embarrassingly small. (See Appendix A for a bibliography of Canadian works in biomedical ethics.) In addition, what Canadian writing there is in the area is concentrated on two topics: abortion and death and dying.

III. Recommendations for Research Projects in Biomedical Ethics

A. Assumptions

The following suggestions concerning fruitful areas for research are based upon three assumptions.

Research efforts should not be duplicated. Areas in which extensive research already has been done, is being conducted at present, or is contemplated in the near future should be avoided. This automatically excludes most of the standard issues in biomedical ethics. Experimentation with human subjects, as mentioned above, has been dealt with extensively in the United States³⁵ and, to a lesser degree, in Canada.³⁶ Abortion, of course, has been a controversial and much discussed topic for a long time. The Law Reform Commission of Canada has published or will be publishing studies on the definition of death, the management of death, sterilization, and consent.

Two areas are worth mentioning as exceptions, however, because although a great deal has been written in these areas, the overall quality of the material is not very satisfactory. They are behavior modification and control and human reproduction and technology. More will be said about these two areas in section D.

Research should be directed at the more pervasive, but less dramatic, issues in biomedical ethics. The focus of research so far has been on the highly visible, highly controversial topics such as brain death, disconnecting respirators, organ transplantation, ante-natal diagnosis, sterilization, psychosurgery, and in vitro fertilization. Concentrating on these issues creates a misleading impression of the moral dimensions of medicine, just as concentrating on the criminal law creates a distorted impression of its place and role in a legal system. The greater danger, however, is that emphasizing these "headline" issues will lead one to ignore the more commonplace and undoubtedly more frequent moral issues in medicine, and may even skew the overall moral approach that one adopts. Several writers have called for a move toward more mundane issues. Robert Veatch, for one, says:

Most of the ethical problems in the practice of medicine come up in cases where the medical condition or desired procedure itself presents no moral problem. Most day-to-day patient contacts are just not cases which are ethically exotic. For the woman who spends five hours in the clinic waiting room with two screaming children waiting to be seen for the flu, the flu is not a special moral problem; her wait is. When medical students practice drawing bloods from clinic patients in the cardiac care unit -- when teaching material is treated as material -- the moral problem is not really related to the patient's heart in the way it might be in a more exotic heart transplant. Many more blood samples are drawn, however, than hearts transplanted.³⁷

Thomas Wallenmaier makes the same point:

...many essays written on medical ethics leave the impression that physicians spend most of their time transplanting hearts, kidneys, and genes. While dramatic technological innovations are sensational news and do in fact open up new areas of medicine whose ethical aspects have not been explored, one cannot equate the practice of medicine in its entirety with the relatively small number of these innovations. The medical situation involves all the things that physicians do, most of them rather straight-forward and commonplace. If the ethical aspects involved in the more commonplace activities of a physician were studied more, perhaps the unusual and sensational cases would not be so problematic. The restriction of medical ethics to a few topics dealing with complicated and esoteric technology gives a rather distorted view of the subjects. It leads one to believe that these problems are chiefly technological and logistical, and it also lends a certain aura of "scientific supremacy" to any discussion of medical ethics; that is, one has the feeling that medical technology is always two jumps ahead of society. In other words, a number of issues are being overlooked and a number of approaches to the issues are being missed because of an over-concentration in medical ethics on a small number of recent and dramatic problems.³⁸

It is time to redress the balance in discussions of moral issues in medicine.

3. Research should be done on the institutional and structural dimensions of moral issues in medicine. The structure of a health care delivery system and its institutions can create moral problems, restrict the range of alternative solutions to a problem, and provide incentives that lead to morally undesirable behavior within the system. One example of each will be presented. The most common way in which a health care delivery system creates moral problems is through the allocation of resources. Consider the dilemma for doctors in a psychiatric institution who are trying to eliminate violently aggressive behavior in one of their patients. One method that can be used is the shock stick. Another method requires the simultaneous presence of four staff members who reward the patient for non-aggressive behavior. The issue of whether it is morally permissible to use a shock stick as part of a behavior modification program arises only because the institution is underfunded, and therefore understaffed, and cannot afford to devote the time of four staff members to one patient.

Hierarchical authority relationships are the source of many moral problems. One example involves a nurse who observes a doctor exerting strong pressure on the wife of a recently deceased patient in order to obtain consent for an autopsy. The nurse believes that the doctor is acting wrongly, but she also knows that the doctor and medical staff will be angry if she intervenes. Her only options within a strict hierarchical authority system are to intervene, anger and perhaps embarrass the doctor, and as a result jeopardize her career and possibly her job, or to ignore the situation and live with her conscience. Such "whistle-blowing" problems can arise whenever there is no institutional mechanism that allows a subordinate to question the behavior of a superior without fear of personal reprisals.

A case in which the organization of a hospital and the incentives for doctors working in the hospital combined to produce a disastrous outcome involves an infant who was born at a gestational age of 24½ weeks and a weight of 800 grams and who was kept alive by a respirator for six months, contrary to the wishes of the parents. The problems suffered by this infant included bradycardia, cyanosis, retrolental fibroplasia, infections, demineralized and fractured bones, aniatrogenic cleft palate, pulmonary artery hypertension, and seizures of the brain. The way to explain what went wrong here is not in terms of evil ends or intentions on the part of the doctors, but rather in terms of the institutional context in which this infant was "treated". For example, effective communication between the parents and the doctors was prevented because a succession of different residents was placed in charge of the infant. In addition, the residents saw the infant's problems as an opportunity to broaden their education by working on a patient who had malfunctions of virtually every bodily system. The specialists in the hospital received some "interesting" consultations, and the hospital collected \$102,303.20 from an insurance company. The power of these incentives cannot be ignored. Martin Shapiro, a doctor, says in his book, Getting Doctored: "Much of the work of physicians is repetitious and straightforward. Because of this physicians enjoy investigating patients with unusual problems: those problems stimulate and challenge the intellect, they are less routine, and they make the work more bearable."⁴⁰ Moreover, the status and prestige associated with a medical breakthrough, with being, for example, the first one to "salvage" an infant of 800 grams, cannot be denied. After the death of this infant, the parents wrote a letter to the hospital, and they say of the hospital's response: "The official reply cited the progress in infant survival that had come about 'because of perseverance in units such as ours' ... Dr. Farrell's ... 'very behavior reflects the hospital's mission of providing tertiary care.'"⁴¹

It is time to recognize the role that institutional factors play in moral problems. The questions that Eliot Freidson says must be asked in assessing the autonomy and monopoly that society grants to the medical profession must be asked of all aspects of the institution of medicine. In Freidson's words:

In the case of both the economic and the social organization of work, the central question for evaluation is ethicality. Given its organized autonomy, which includes a monopoly to provide services and a legally dominant role in determining the kind of services other occupations provide, does the profession organize itself in such a way as to prevent the practitioner's natural concern with his own economic security and advancement from dominating his ethical concern with the good of his clientele? Does the profession organize itself in such a way as to assure that each of its members works in ways reflecting the highest possible standards?⁴²

These questions can easily be modified. Does the institution of medicine prevent the practitioner's natural concern with his own economic security and advancement from dominating his ethical concern with the good of his patient? Is the institution of medicine organized in such a way as to assure that each of its members works in ways reflecting the highest possible standards?

Karl Mannheim has said, "Both motives and actions very often originate not from within but from the situation in which individuals find themselves."⁴³ If one wants to avoid morally undesirable outcomes in medicine, one ought to begin by looking at the incentives and motives for health care professionals that are built into the

structure and organization of the institution of medicine.

B. The Conceptual Framework

A preliminary and tentative attempt to map the theoretical structure of biomedical ethics is given in Figure 1. Several explanatory comments are in order. First, MacIntyre's criticisms of contemporary analytic moral philosophy have been taken seriously. The construction of a plausible moral theory (MORAL THEORY₁) requires a theory of the self, a theory of mind, a theory of action, and a psychological theory of motivation. Each of these theories will be related to one another. The point, however, is that moral theory cannot be formulated in a vacuum, independently of views about, say, what it means to be a person, the nature of motivation, and the nature of personal responsibility. To trace one set of connections very crudely, holding a person morally responsible for an action presupposes that the agent could have acted otherwise, which presupposes a theory of motivation.

Second, the relationships between the elements in Figure 1 are both normative and descriptive. The solid lines represent normative connections. Certain key questions in political theory, such as the nature of freedom, responsibility, and individuality, the extent to which the state is entitled to interfere with the liberty of its citizens, and the proper relationship between law and morality, can be answered only in terms of a higher moral theory. Answers to these questions in turn constrain the kinds of public policies that a society ought to have through a normative theory of public policy that will determine, for instance, the kinds of considerations that are relevant to the analysis of public policies and to decisions between competing public policies. And, of course, normative theories (MORAL THEORY₂, MORAL THEORY₃, and MORAL THEORY₄) must be used to deal with the moral problems at both levels in the institution of medicine and at the individual decision-making level.

The dashed lines represent empirical, causal connections. The impact of technology on the institution of medicine and on individual decision-making can be illustrated by how the development of CAT scanners has affected the overall allocation of resources within a health care delivery system (macro level), the kinds of diagnostic tests that are available and therefore performed (micro level), and the amount and reliability of information that is relevant to a decision (individual decision-making level). Existing public policy (or the absence of public policy) will determine the role that technology plays in society and the overall structure of the institution of medicine. And within the institution decisions at the macro level will shape the micro level and the decisions that must be made there. This leads to the final point. Figure 1 is intended to emphasize that individual decision-making about moral issues in medicine always takes place within the institution of medicine. At the same time it must be recognized that the institution of medicine is an institution within society; moreover, it is one among many institutions within society. The structure of the institution of medicine is determined by the structure of society and the moral and political views of society. All of the problems of medicine, therefore, cannot simply be laid at the feet of the institution of medicine in the form of, say, attacks on the nature of medical education or the way that health care is financed. Rather, one must look deeper to see why the institution is structured as it is, that is, why this particular institution exists in this particular society.

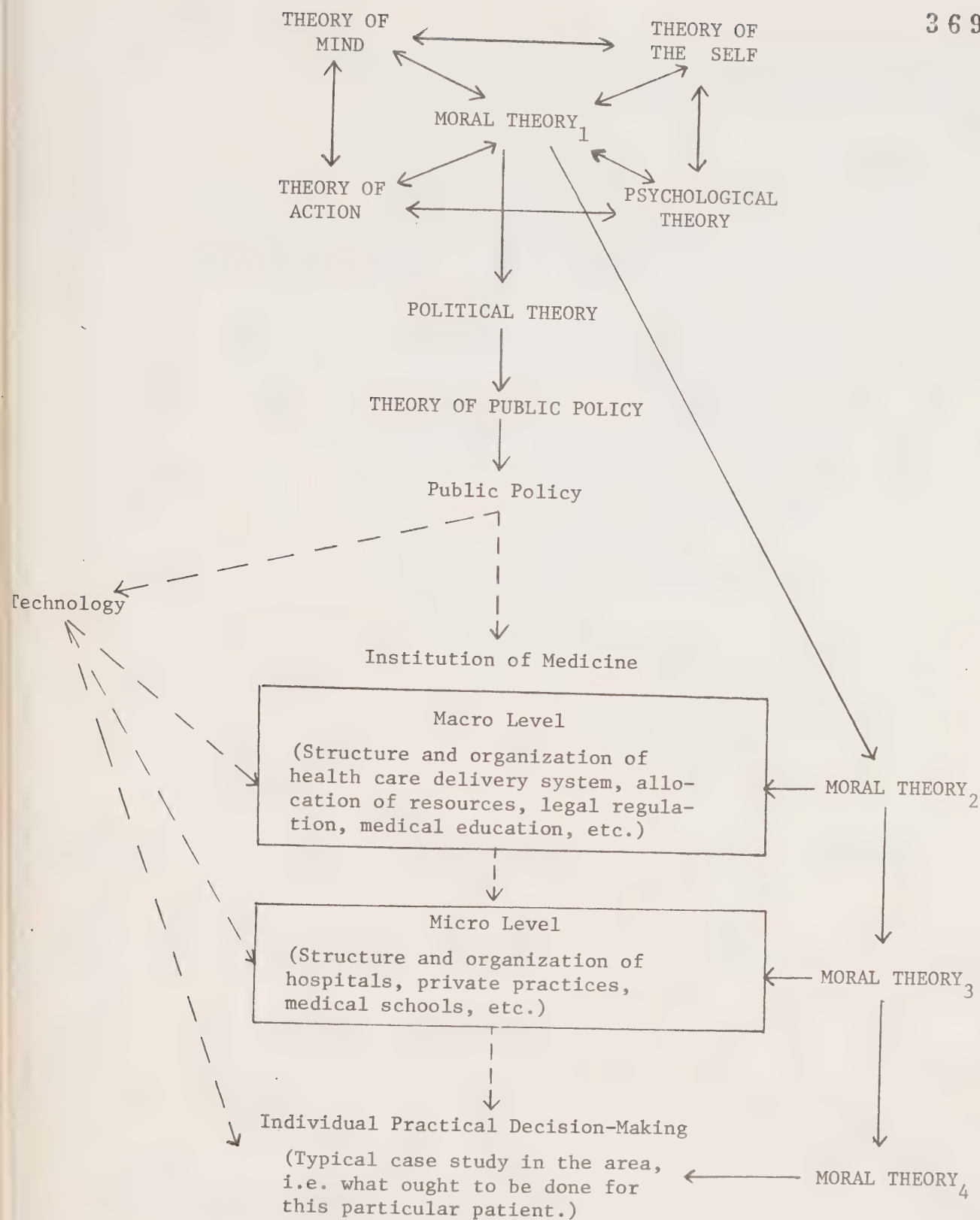


Figure 1

Given the conceptual map of biomedical ethics in Figure 1, three general areas that require research stand out.

1. Basic Foundational Research

The first topic for research in this area is, obviously, the conceptual map itself. In what ways is the map incorrect, misleading, or oversimplified, and what omissions are there? Work then needs to be done on all the theories in the map and on the connections between the theories. Priority, however, should be given to the development of a normative theory of public policy. Such a theory is needed to guide the formation, implementation, and assessment of public policies. A normative theory of public policy must contain at least two components. On the one hand, there must be a theory of the policy process. This theory would be empirical in that it would describe the various procedures by which public policy is made and normative in that it would specify the considerations that are relevant to decision-making at each stage of the policy process. On the other hand, there must be a theory of policy analysis, that is, a theory about how policy proposals ought to be assessed, either prospectively or retrospectively. An example of the normative problems that can arise in policy analysis is provided by the testing of carcinogens. The standard test for carcinogenicity is the maximum tolerated dose (MTD) test. In this test the maximum dose that will allow the experimental animals to survive is given to a small number of animals. As Barry Bloom points out, the MTD test is based on a crucial assumption that may not always hold:

This approach to testing is based on the assumption that there is a linear relationship between the amount of a carcinogen given and the incidence of neoplasms in experimental animals. The higher the drug dosage given, the fewer the animals that need to be studied, the higher the incidence of tumors, and the less expensive the testing. While the basic assumptions of the approach appear to be justified in testing a number of well-known "strong" carcinogens (such as aflatoxin, the mold that develops on stored peanuts), it is highly controversial whether this approach is relevant to all agents, particularly "weak" carcinogens (such as saccharin).⁴⁴

Bloom suggests that instead of asking the question, "Does X cause cancer?", society should ask about the relative probability or potency of various agents to which people are exposed. In Bloom's words:

Rather we should know the carcinogenic potency in terms of the amount of drug required to cause cancer in, for example, 50 percent of the animals studied. Then many agents could be ranked according to the amounts required to produce a given incidence of cancer. Some agents will be weak; others more active.⁴⁵

MTD testing cannot answer this kind of question, but the technique of risk quantification would be relevant to it. The investigation of what questions ought to be asked about public policies, what analytic techniques are most appropriate for answering these questions, and what normative assumptions are built into the analytic techniques would be an important component of a theory of public policy.

Work also needs to be done on the connections between the theories on the map. A particularly troublesome feature of Figure 1 is the relationships between MORAL THEORY₁, MORAL THEORY₂, MORAL THEORY₃, and MORAL THEORY₄. One might argue that they are distinct, but consistent, theories because different kinds of moral issues arise at the different levels. MT₂, for example, would have to deal with questions of distributive justice, while MT₄ would have to handle the issue of whether a particular patient ought to be allowed to die. Another view would draw a line somewhere between MT₁ and MT₄. The two most likely places to draw the line are between MT₁ and MT₂ and between MT₃ and MT₄. The theories above the line then would be seen as part of political theory and the theories below the line as part of moral theory. Charles Fried suggests this kind of distinction when he discusses "the antinomy between the personal and the social":

In any larger social group there is a system of significant impingements within the group that do not entail personal relationships, or even actual or possible knowledge of identity. This obvious and pervasive fact is recognized by political theory, while specifically ethical theory has usually focused on the principles of personal relations and thus tended to ignore it. Moreover, the principles and concepts in each domain do not easily translate into each other, if they can be said to be consistent at all. And even the point of demarcation between the realm of the personal and the realm of the general is uncertain, with both ethics and political philosophy treating this boundary as problematic. Consequently not only do we think in ways that are hard to bring together, but also the realms of application of these two systems of thought often overlap, leading to inconsistent results. Writers as far apart as Aristotle and Max Weber have noted this difference, and have noted as well the difficulty if not the impossibility of completely dovetailing the two theories into one general theory.⁴⁶

Thus, determining the relationships between the four moral theories can be seen as an attempt to remove the (putative?) conflict between the personal and the social.

Despite all this, a committed utilitarian would argue that utilitarianism is the correct moral theory at all four levels. Utilitarianism can answer questions about how society ought to be ordered and how resources ought to be distributed, as well as questions about what action is right in any given situation.

The theoretical issues here are imposing. But without the big picture moral theory will continue to flounder.

. Institutional Aspects of Moral Problems in Medicine

Before one begins tinkering with or revamping the institution of medicine in an attempt to avoid morally undesirable outcomes or to produce morally preferable outcomes, one needs a much better understanding of the structure, organization, and functioning of the institution. Three broad areas of research are suggested. One is the impact of external factors on the institution. These would include the allocation of resources to health care in society, the method of payment for health care services,

the funding of health care research, and legal regulation of the health care decisions. A second is the impact of internal factors on the institution. These would include the nature of health care education, the organization of health care into areas such as medicine, nursing, occupational therapy, and physical therapy, and the further sub-division of these areas into specialties, and the allocation of resources within the health care delivery system. Finally, various models of decision-making within the institution need to be identified. One would expect decision-making in a hierarchical authority system, for example, surgery, to be significantly different from decision-making in an interdisciplinary team setting, for example, a family practice team. In addition, one needs to know how certain decisions get made. Consider a kidney patient who needs dialysis. There are two forms of dialysis available, hemodialysis and peritoneal dialysis. Hemodialysis can be done in hospital or at home. There are two forms of peritoneal dialysis, intermittent peritoneal dialysis and continuous ambulatory peritoneal dialysis (CAPD). Only intermittent peritoneal dialysis would be done in hospital, but either intermittent peritoneal dialysis or CAPD can be done at home. Thus there are five options for a patient who needs dialysis: hospital hemodialysis, home hemodialysis, hospital peritoneal dialysis, home intermittent peritoneal dialysis, and home CAPD. How does the decision about which form of dialysis a particular patient will receive get made? Undoubtedly the physician's view about which form of dialysis is "best" plays an important role. The allocation of resources also will be a significant factor because not all forms of dialysis will be available in every geographical region. To what extent are the patient's desires considered? What other factors play a role in the decision?

How decisions are made must be known first. Then if one discovers that certain kinds of incentives are important or that there are significant differences between the decisions that emerge from different models of decision-making, one can proceed to the further tasks of assessing the decisions and changing the incentives to produce better decisions or restructuring the institution along the lines of the decision-making model that leads to better decisions.

3. The Role of Technology in Society

Many issues in biomedical ethics arise as a result of the development of new technologies. Whether "brain death" is really death, for instance, was not an issue before the advent of respirators and techniques for organ transplantation. The area in which technological developments probably will create the most problems in the future is human reproduction. The controversy that surrounded the birth of the first "test-tube" baby is a harbinger of problems to come if techniques are perfected for embryo banks, embryo transplants, and artificial wombs. These developments will shake the foundations of our moral and legal systems. To illustrate this point, imagine the following scenario. A human egg is fertilized in a laboratory and then implanted in an artificial womb. At about the twentieth week of development, a laboratory technician decides, for whatever reason, to dispose of the contents of the artificial womb. Has the laboratory technician committed a criminal offence? One might think he has committed the crime of abortion. But section 251 (1) of the Criminal Code says, "Every person who, with intent to procure the miscarriage of a female person, whether or not she is pregnant, uses any means for the purpose of carrying out his intention is guilty of an indictable offence and is liable to imprisonment for life," and by no stretch of the imagination can an artificial womb qualify as a "female person". What about homicide? Section 205 of the Criminal Code says, "A person commits homicide when, directly or indirectly, by any means, he causes the death of a human being." Has the technician caused the death of a human being? Regardless of the moral answer one gives, the legal answer seems clear. Section 206 of the Criminal Code reads, "A

child becomes a human being within the meaning of this Act when it has completely proceeded, in a living state, from the body of its mother..." Since an artificially gestated entity never proceeds from the body of its mother, it is, for the purposes of the law, not a human being. Nor can the technician be convicted of infanticide because infanticide (section 216) requires that a female person cause the death of her "newly-born child". So the technician would appear not to be criminally responsible for his act. The point is that the view of human reproduction as a "natural" process is deeply embedded in the Criminal Code. And because criminal law is founded largely on society's moral beliefs, the new reproductive technologies will threaten the underpinnings of society's moral and legal systems.

It is useless to try to deal with the moral issues raised by new technologies on a post hoc, piecemeal basis. The role of technology in society is a public policy issue. The impact of new technologies can be so pervasive that the nature of society is dramatically altered. Think of how fundamentally society has changed since the invention of automobiles and television. Decisions about the extent to which the development of technology will be controlled and regulated involve normative decisions about the good life and the good society. What is desperately needed is a theoretical framework within which these normative decisions can be made and public policy concerning technology can be formulated. Nothing worthwhile can emerge from polemical attacks on the part of those opposed to technological innovation or charges of Ludditism and invocations of the specter of Galileo on the part of those who favor technological innovation. A general theoretical approach to the problem of technology, once developed, should be as applicable to medical technology as it is to technology in other areas.

D. Specific Topics for Research

Seven specific topics for research are recommended. How each fits into the conceptual map of biomedical ethics will be discussed briefly.

1. The Concept of Moral Autonomy

The concept of moral autonomy should be a key ingredient in MORAL THEORY₁. It is relevant to issues such as the nature of freedom, the nature of responsibility, and the extent to which the state is entitled to interfere with the liberty of its citizens. The notion of autonomy seems to have two main uses in biomedical ethics. In one of its uses it appears to be a synonym for self-determination. Some strange remarks are made about autonomy when it is understood in this way, however. In discussing the case of Mr. D., who attempted suicide by driving his car into a telephone pole and who subsequently refused surgery in the emergency room because he knew he was dying of carcinoma of the tongue anyway, Robert Litman comments, "By placing himself in the position of requiring emergency medical help to save his life, Mr. D. has forfeited his autonomy for the time being," and "If it turns out that there is no treatable mental illness, he will, at a later date regain his autonomy and his capability of disposing of his life as he chooses."⁴⁷ Is autonomy something that can come and go, as Litman suggests?

At other times acting autonomously seems to be understood as acting voluntarily. It is suggested, for instance, that offering prisoners hundreds of dollars to participate in medical experiments would violate their autonomy, or that offering a man convicted of an alcohol related offence the choice between imprisonment and participation in a research study on the treatment of alcoholism would violate his autonomy.

Many people seem to feel that simply putting individuals into these kinds of choice situations is wrong. But why it is wrong is not so clear. These are not cases of coercion. The explanation seems to be that they are violations of an individual's autonomy because the choices are not "truly free" or "truly voluntary".

A further complication is introduced by Robert Veatch when he suggests that there is a distinction between the autonomy of an individual and the autonomy of groups such as the family.⁴⁸ Does the notion of group autonomy make sense?

The concept of moral autonomy required for MORAL THEORY₁ would be different from autonomy as self-determination or autonomy as voluntariness. Moral autonomy at this level would have to be linked to the development of personality in an individual and ultimately to the question of what it means to be a person.

2. Mental Retardation

Mental retardation today is recognized as a social problem as well as a medical problem. Michael Maloney and Michael Ward, the authors of a recent textbook on mental retardation, emphasize the "cultural relativity" of mild mental retardation:

Why was mild retardation essentially unknown or unrecognized until approximately 100 years ago? The answer turns on the crucial relationship between mental retardation and society. Severe retardation has a cultural and historical universality; it has been recognized and detected in all societies and at all times. But the situation changes dramatically when we consider the mildly retarded. It was not until the emergence of modern society, with its vast industrial, technological, economic, and sociopolitical changes, that greater intellectual demands were placed on man in his attempt to survive and adapt....Existence in our complex modern society is much more determined by man's intellectual skills and abilities....What we must realize is that it was the changes in society, not changes in the individuals themselves, that brought about the problem. It is in this sense that mental retardation is primarily a modern phenomenon. Moreover, it becomes obvious that mild mental retardation is a condition rather than a disease. The condition exists only under certain circumstances and can change when the circumstances change. Modern society is the circumstance, or precipitating factor, that has created the condition of mild mental retardation. Furthermore, this condition could not exist except for the fact of modern society and its demands on intelligence.⁴⁹

They cite three social trends, industrialization, urbanization, and mass education, as responsible for the development of the modern concept of mental retardation.

Given the intimate connection between the nature of society and the concept of mild retardation, the multi-disciplinary approach to problems in mental retardation (involving at least medicine, nursing, psychology, sociology, and law), and changing views about the role of the mentally retarded in society (the move to de-institutionalization founded on the principles of normalization and the least restrictive alternative), the area of mental retardation would provide an excellent opportunity to

pursue the institutional aspects of moral problems in medicine. For instance, what problems are created by the overall level of resources allocated to the care and treatment of the mentally retarded and by how those resources are distributed (building large institutions versus developing programs for comprehensive community care)? How have the disease model of mental retardation and the psych-social model of mental retardation influenced the provision of services to the mentally retarded? What behavioral problems are created by the way services are provided and how should these behavioral problems be handled? For example, what should be done with "walk-aways", residents of an institution who leave and perhaps commit a criminal offence? Could involuntary sterilization be avoided by more imaginative ways of providing services to the mentally retarded? What incentives are there for physicians to become involved in the treatment of the mentally retarded or in research in mental retardation?

Mental retardation also can be linked to the issue of the role of technology in society. As the technological complexity of society continues to increase, the number of people classified as mentally retarded probably will increase. Technology should be added to the list of social trends responsible for the modern concept of mental retardation. What should society's response be to the people who cannot cope with the more rigorous demands of life in modern society?

Little research has been done on moral issues in mental retardation.⁵⁰ The areas of consent and sterilization are two exceptions, but the broader spectrum of issues remains untouched.

3. Family Medicine

The place to look for the more mundane but more pervasive moral issues in medicine is family medicine. The first step would be an empirical investigation to determine how family physicians and family practice teams actually deal with moral issues. One would want to know, for example, what kinds of problems they identify as ethical problems, what factors enter into their classification of a problem as an ethical problem, and how they handle ethical problems. This could lead to a broader attempt to identify the kinds of moral problems that arise in family medicine. Many of these problems undoubtedly would overlap standard issues in biomedical ethics such as consent and paternalism. Some, however, might be new. For example, a family physician may be tempted to try to change the lifestyle of a patient when the patient's medical problems are being caused by psychological or social problems at home. When is such intervention morally justifiable? Family physicians do a great deal of counseling with respect to psychological, social, and sexual issues. What is the proper role for a family physician engaged in such counseling?

Family medicine also would be a good area in which to investigate the institutional aspects of moral problems. Family medicine in Canada is a distinct and unique branch of medicine; it is not to be equated with primary care delivered by, say, an internist or a pediatrician. Moreover, continuous care, as opposed to episodic care, is more likely to be delivered by a family physician. How do the structure of family medicine in Canada and the nature of the physician-patient relationship that emerges affect the kinds of moral problems that arise and how these moral problems are and should be handled? In addition, family medicine teams would be a good place to investigate inter-disciplinary decision-making. Some family practice teams hold weekly meetings to discuss patients who should be followed closely, and everyone on the team, including the receptionist, secretary, social worker, public health nurse, team nurses, residents, and team physician,

participates. Does this kind of decision-making differ significantly from decision-making by an individual family physician?

4. The Role of the Nurse in the Health Care Delivery System⁵¹

How decisions are made and ought to be made is important in an investigation of institutional aspects of moral problems. Nurses are a valuable source of information about patients because, of all the medical professionals, nurses have the closest relationships with patients. An important area for research, consequently, is the role that the nurse plays in decision-making. Does the information about a patient that the nurse uniquely possesses get utilized in the decision-making process or is it lost? The answer undoubtedly varies from one area of nursing to another and from one organizational structure to another. In a hierarchical authority relationship the nurse is excluded from decision-making, or at least relegated to a subordinate role. As a result the unique information possessed by the nurse probably is lost. In such a situation nurses are given the responsibility of implementing decisions but no role in the decision-making itself and thus no accountability. Where the delivery of health care is organized on an interdisciplinary team basis, the unique formation possessed by the nurse can, at least in principle, be incorporated into decision-making. Thus, one needs to know more about the role that the nurse plays in different models of decision-making. One would expect better decisions to emerge when the nurse plays an active role. The decisions would be "better" at least in the sense of being more informed. They also could be "better" in the sense of being more in accordance with what the patient wants; because the nurse is in a privileged position to know the patient's wishes, desires, and values, the nurse could act as an advocate of the patient and insure that the patient's perspective is included in the decision-making process.

A related issue concerns how nurses in clinical practice process the information that they receive, especially when this information is of an ethical nature. If a nurse knows that a patient is contemplating suicide, for instance, will this information be withheld from or shared with the team? How does a nurse decide which personal information should be kept confidential and which information, even though personal, is relevant to team decision-making and therefore must be revealed?

Another area of research involves the ethical questions that will arise in connection with the expanded role of the nurse practitioner. One set of questions would involve trying to anticipate the moral problems that a nurse practitioner, say, will have to handle. But the moral issues here run deeper. Nursing is founded on a health promotion and prevention model, with a strong social science orientation in addition to the physical science component, as opposed to the disease model that is the basis of most medical practice. Are different moral issues associated with these different models? How ought conflicts between these models, for example, in the form of allocation of resources and, even more fundamentally, in the recognition of the legitimacy of the health promotion and prevention model, to be resolved?

5. Human Reproduction and Technology

As mentioned above, human reproduction is the area in which technological advancements in medicine are likely to have the most profound repercussions. Consider only one possible side effect of these techniques, sex preselection. Several authors have pointed out that if parents are allowed to determine the sex of their children, the sex ratio in society is likely to change; a different ratio of males to females in turn could

have a significant impact on, for example, the size and composition of families, the availability of marriage partners, the age of marriage, employment patterns, schooling, and the prevalence of prostitution and homosexuality. 52 Society must decide the extent to which new reproductive technologies should be controlled. Such a decision requires a vision of the future state of society if these reproductive technologies are available and a vision of the future state of society if they are not available. Then a normative decision about which of these two states of society is better must be made. At present a few techniques, for example, scenario analysis and the Delphi technique, exist for trying to project what society will be like in the future. These techniques need to be refined and new and better techniques need to be investigated. More important, a theoretical framework for making normative decisions between alternative projected states of society needs to be developed. The existing literature in the area of societal control of medical technology is not helpful because the fundamental normative issues are not being addressed.

6. Behavior Control and Modification and Technology

The same point can be made about the literature on the use of new technologies to control and modify human behavior. Technological developments in this area may give man the ability to design human beings. But the key normative issues are not being addressed in this area either. Should society control the development of behavioral control technologies? Given the ability to design human beings, what kinds of human beings ought to be produced? 53 What kinds of needs, talents, and abilities should they have? In what areas should homogeneity be sought, and in what areas should heterogeneity be sought? At a minimum, a decision about whether to halt or regulate the development of behavioral control technologies must take into account the kinds of normative questions that will arise if the technologies are introduced and the possibility of answering these questions in a satisfactory fashion.

Even when behavior control or modification does not involve new, more sophisticated technologies, no satisfactory theoretical framework exists for addressing the moral issues raised by attempts to direct people's behavior. Consider the subliminal anti-theft messages ("I am honest. I will not steal.") that are being broadcast by some stores in Canada and the United States. Is it morally wrong to try to prevent shoplifting in this way? If so, why is it wrong? A tempting answer is that such techniques violate people's moral autonomy, but a satisfactory account of moral autonomy is needed before this answer can be convincing.

7. Occupational Health 54

Another area in which questions concerning the institutional and societal aspects of health care arise is occupational health. The value and moral issues here generally are ignored by academic writers in biomedical ethics. But in occupational health, as in the more general area of lifestyle medicine, there are difficult questions about the responsibility for disease. For example, if a worker is apprised of the risks associated with his or her job, should the worker to have "assumed" those risks and therefore be held individually responsible for any occupation-related disease? A more dramatic issue concerns whether a company can force a person who will be exposed to teratogenic agents to be sterilized as a condition of employment. Other issues include: 55

Is it ever permissible to withhold information about the full extent of an occupation-related disease from a worker, for example, on the grounds that the disease is progressive and irreversible and that the worker only will be transferred to a lower-paying job if this information is disclosed?

Should the burden of proof for demonstrating that a work environment is safe be on industry, government, the exposed workers, or the group questioning the environment's safety?

How safe must an industry be before it is allowed to operate?

How should the risks and profits from an industry be distributed? Should those subject to the greatest health risks also benefit most from the industry?

What role should "experts" play in determining "acceptable" levels of risk?

Again, a broadly based, interdisciplinary approach is necessary to confront these kinds of questions.

E. Practical Suggestions

Several practical points should be kept in mind with respect to any research in biomedical ethics.

1. Research in this area must be genuinely interdisciplinary in at least three respects. First, to bridge the gap between the practical and the theoretical, research should involve both clinicians and non-clinicians. Second, many of the suggested research projects require answers to descriptive, empirical questions before the normative questions can be addressed. Here cooperation between the scientists and social scientists who can answer the empirical questions and philosophers and theologians who are interested in the normative questions is essential, from the start of any research project. Third, some of the suggested research projects are, in their very nature, interdisciplinary. The concept of moral autonomy, for instance, has both philosophical and psychological dimensions.
2. Research projects should, whenever possible, be coordinated. The Law Reform Commission of Canada and the Science Council of Canada, for example, may establish research programs in some of the areas suggested above. If so, any new research efforts should complement their projects. In addition, it may be possible to establish connections with the research projects at the various Health Care Research Units in Ontario. The Health Care Research Unit at the University of Western Ontario, for example, is presently doing research into the area of alternative treatment modalities for dialysis patients, and it may be conducting research in several other areas that have obvious moral aspects.
3. Non-clinicians who do research in biomedical ethics must have some clinical experience, at least in their areas of research. It is not possible to contribute meaningfully to discussions of moral problems in medicine without having some direct experience of what these problems are and the complexities of the problems. Any research project that is established, therefore, should stipulate that all non-clinicians involved in the research must obtain clinical experience in the research field.
4. It is useless to do research in biomedical ethics unless the results of the research are communicated to those affected by the moral issues. Any research project, therefore, should include some provision for educational health care professionals, professionals in other areas who may be interested, for example, lawyers, and lay persons about the outcomes of the research.

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an a posteriori example

Judith Miller

This paper presents issues which stem from work in progress for a Science Council of Canada (SCC) study: Science and the Legal Process.* The study is examining areas where the interfaces among social change, science and law in the broadest sense are important. Biological advances and their impact provide case study material.**

Judge David Bazelon states:

"As government health and safety regulation has become pervasive, there is a pressing need to redefine the relation between science and law. This is one of the greatest challenges now facing government and, indeed, society as a whole."***

Limited field resources required us to select specific research directions carefully. First we decided to examine real issues, situations which exist now or in the immediate future. Hence we are not speculating at length about possible regulation of sale of body parts for transplantation. Nor are we studying the epistemological basis of applied ethics. On the other hand prenatal diagnosis is a focal point of the study. Second, we chose to work with important issues. We defined important in two ways. Issues should actually or potentially affect many people in a non-trivial way. They should also warrant our consideration in that time alone does not seem sufficient to resolve them. We thus disregard issues such as possible stigmatization of "test-tube" babies, produced by in vitro fertilization and subsequently implanted in the woman who donated the egg. Third, we directed research into areas which might lead to Canadian policy recommendations. This last criteria minimized foreign comparisons and research into such areas as details of existing laws,**** which are under provincial legislatures' jurisdiction and where implementation of any Science Council policy recommendations would be extremely difficult.

The study originally evolved from a perception of differences between legal and scientific concepts of fact, knowledge, probability, proof and so forth, and a desire to find ways of coping with these differences in a society where science enters more and more into governmental concerns.

*Please note none of the views expressed here reflect positions endorsed by the Science Council of Canada.

**Copies of "The Resolution of Social Problems of Scientific Origin: Issues in Science and Law" which expounds the motivation for selecting biological case study material, are available from the Science Council of Canada.

***David L. Bazelon, "Risk and Responsibility", Science 205, 20 July 1979, p. 277.

****The Law Reform Commission's work on "Protection of Life" serves as a further reason to eschew this particular type of issue.

The study addresses three major themes:

- 1) What is the impact of science on the regulatory process in government?
- 2) What is the role of government in science and how does regulation affect science?
- 3) What scientific issues incorporate values and what mechanisms are desirable/existant to deal with such issues?

A brief review of work in progress and future anticipated work for this study follows.

Theme 1: What is the impact of science on the regulatory process of government?

The first theme underlies several papers in progress. One of these is examining departmental decision-making in government departments and hopes to convey a sense of a typical agenda over a short time span, its scientific and public inputs and the method of handling issues and establishing priorities. In this regard, the paper will assess three government departments: Consumer and Corporate Affairs, Energy, Mines and Resources and Health and Welfare. A complimentary paper addresses how scientific and public considerations enter over time into commissions of inquiry, regulation and policy formulation.

This second paper analyzes three kinds of scientific assessment:

- 1) science as innovation, e.g., satellites;
- 2) science as technology assessment, e.g., nuclear energy;
- 3) science as evaluation of risk in use of product, e.g., aluminum wiring and marijuana.

This research to date raises several important issues. Among these are:

- what is science and who is a scientist?
- what is accountability and to whom is regulation accountable? The regulatory organization? A particular constituency? The public?
- Who is the public and what is public input?

The study envisions other work in the context of the theme of impact of science on government. This includes workshops to explore the inquiry process, public participation, accountability, trans-science and hypotheticality. These last refer to scientific problems where the definitive experiment is impossible to carry out. Decisions must be made with considerable uncertainty. A paper on the nature of the regulatory process perhaps best suited to science will examine routes to flexible, on-going management with well-established feedback as opposed to closed, one-time standard-setting.

Theme 2: What is the role of government in science and how does regulation affect science?

The second theme of the study, the role of government in science, centres around the recombinant DNA controversy. In this area the study is exploring the regulatory process as it occurred in England, Canada and the United States. The recent change in perception of the degree of risk of recombinant DNA work and the consequent loosening of guidelines are still another fascinating facet of the regulatory process. The current easy availability of required enzymes to conduct recombinant DNA experiments and the simplicity of required equipment now make regulation and monitoring in this area a matter of faith in each individual researcher's goodwill and commonsense. A future workshop may focus on recombinant DNA and limits to inquiry.

The study will also examine market factors affecting the introduction of new technologies, especially in regard to applications of genetic engineering in industry, agriculture and pharmaceuticals. Work in this area suggests that the timing for controlling directions of research and for airing concerns is crucial. Early warning is essential. Once science and technology have developed a marketable commodity such as the birth control pill, economic forces take over. The choice is then already made. Another essay will address the impact of commercialization on the conduct of recombinant DNA research.

Theme 3: What scientific issues incorporate values and what mechanisms are desirable/existant to deal with such issues?

This final theme of Science and the Legal Process relates the most directly to my own expertise. Hence, the issues and directions of work relating to this theme are more extensively elaborated. Work to date includes a workshop, held September 10-11, 1979, "Social Issues in Human Genetics: Genetic Screening and Counseling". I am currently researching a paper on bioethics and its relevance to policy formulation. Other papers on: methods of resolving scientific controversy, on the use and abuse of psychology in policy formulation and possibly on confidentiality of information and access to information complete the current proposed rostrum.

A general look at implications of genetic counseling and screening sets the stage for discussion of the workshop on prenatal diagnosis. The cardinal purpose of genetic counseling and prenatal diagnosis is the prevention and treatment of highly

disabling genetic or congenital diseases. The majority of such diseases are not curable and frequently not even treatable at this point in time. The diet-therapy available for phenylketonuria (see below) and the enzyme or vitamin substitution therapy available for some deficiency disorders are notable as exceptions. The psychological effects of such diets and their effects on life-style are not well-established (their unpalatable quality is). In most cases the only preventive course of action is nonreproduction by individuals likely to transit deleterious conditions or selective termination of pregnancies where the fetuses are shown defective.*

Either action impinges on the legal and social systems. A major underlying assumption here is that we know how to define a defective individual or a life not worth living. In fact criteria vary widely. In California recently a fetus was aborted because it was the wrong sex. Hare lip and cleft palate can be detected prenatally. They can also be surgically mended. Are they grounds for termination of pregnancy? The ascertaining of what disorders so destroy quality of life that the risk of transmitting them to progeny should not be taken is difficult. So far such decisions have been largely ad hoc, determined by an individual with the aid of a genetics counselor. Is it possible and desirable to establish guidelines? What institutional form is best able to handle such decision-making? If priorities and guidelines are established, does the state have any right to force adherence by individuals not able to care for prospective defective children? What alternatives can be made available if we put high value of the sanctity of life? Some fear genetic quests for perfect children will promote intolerance.

One issue here concerns the effect of consistent, standardized selection on the gene pool. A high degree of variation plays a part in adaptation to environmental challenge. Genes deleterious in one environment may confer advantages in another. A single dosage of the gene for sickle cell anemia provides malaria resistance to the carrier. Can we specify whether effects are "good" or "bad" on the basis of our current knowledge of genetics and without fallaciously assuming environmental constancy?

A side issue here is the question of abortion under Canadian law. Canadian law allows abortion when the health and well-being of the mother are endangered. A mother carrying an afflicted fetus must establish before a hospital committee

*N.B. There are always a percentage of false positives and false negatives in such tests. In addition, some tests are ambiguous as to severity of condition. This contributes to an ethical dilemma. Obviously one research priority would be towards developing more precise tests so as to reduce these factors.

that bearing such a child would be detrimental to her psychological health. Only on such grounds can a woman obtain a legal abortion. There is an obvious contradiction in law and in social practice here.

Genetic counselors assume on the whole that counselees make rational decisions by weighing risks in a rational, linear way. Dr. Abby Lippman-Hand's work* clearly expounds a different model of decision-making. She suggests counselees operate from worst case projections and that real differences exist between what the genetic counselor thinks he/she is conveying and what the counselee perceives. This sort of research is of obvious significance and interest. The psychological effect of counseling and therapeutic abortion are also in need of further evaluation.

Genetic screening is an assay in the population at large for one or more genetic conditions carried out with a mass population. Such an assay may involve biochemical studies, examination of blood abnormalities, chromosome examinations and the like. Screening involves looking for carriers** or afflicted individuals where individuals have not personally sought advice from a genetic counselor. It is the accumulation of genetic data, at birth or later, for purposes of assessing genetic risk, counseling prospective parents or treating certain diseases, e.g., phenylketonuria. Phenylketonuria is an exception to most known genetic diseases in that it is possible to treat the condition if detected early enough. A diet low in the amino acid phenylalanine will prevent mental retardation caused by the inability of phenylketonuric individuals to metabolize phenylalanine. Where genetic disorders are untreatable, the value of screening is less clear and possibly a disservice.

The implications of screening programs will be examined here in some detail. Legal problems and social problems will be treated separately. One major legal problem is that of confidentiality. Easy access to mass genetic data would facilitate research in genetic disease, its treatment and cure. On the other hand, easy access to such data might penalize individuals at risk. An individual, for example, may wish his employer not to know the fact that he runs a 50 per cent chance of developing Huntington's chorea, characterized by degeneration of the nervous system commencing generally between thirty-five and forty-five years of age.

*Abby Lippman-Hand, Genetic Counseling: Parents' Responses to Uncertainty, PhD thesis for Department of Biology, McGill University, Montreal, P.Q. November 1977.

**A carrier - an unaffected individual who can transmit a genetic condition to offspring. Carriers have one normal copy of the gene in question and one abnormal one.

Privacy of the individual is also a concern here. Observations of the development of a disorder for a scientific study may violate an individual's right to privacy. When individuals with an extra Y chromosome were thought to have criminal tendencies, screening programs which detected such individuals raised the possibility of monitoring behavioral development and attempting to modify such tendencies when they originate. In fact this correlation between XYY and criminality has now been shown to be unsubstantiated. What recompense would there have been for violation of rights (required special schooling perhaps) when the scientific basis for a screening premise was reversed?

Another legal problem from screening concerns the nature of the family. Do we have the right to procreate? Is it possible for treatment of genetic disorders to be compulsory as in the case of certain vaccines? Can screening be compulsory? How could compulsory treatment to ensure low genetic risk be attained? What effect does screening and identification as a carrier have on individual self-esteem and on family relations?

A host of social problems arise in the screening programs. Again phenylketonuria screening programs illustrate these. It is necessary to ask if the cost of screening and the rarity of occurrence of the disease merit mandatory screening programs or resource allocation. The emotional strain of treatment such as continual special diet might also be considered in evaluating such programs. A further development in this particular case is that women with phenylketonuria treated by special diet seem to have a high risk of bearing abnormal fetuses. Here we might be trading one deficiency for another in the next generation.

A social problem arises with screening in the area of possible social stigmatization. Screening may result in self-fulfilling prophecies. The screening programs with sickle cell anemia raised some problem in this area. Sickle cell anemia is a serious blood disease. Screening programs can detect carriers, who are themselves largely unaffected. Sickle cell genes are prevalent in black populations who resisted screening as they viewed the process as a discriminatory one to control their procreation. A poor educational component with the screening program and inadequate counseling of carriers detected lead to confusion of carrier state with disease state. Resultant social stigma and occupational discrimination has raised the question of the advisability of carrier screening programs. Stigmatization has led to a fear by minority groups of genetic suppression through someone else's idea of the genetically superior individual. Nazi race propaganda continues to make eugenics an extremely sensitive area.

Legal problems of confidentiality and consent arise when a screening program discovers a disorder not specifically designated by the program. A chromosome examination to detect carriers of Down's syndrome may reveal an individual with the abnormal chromosome constituency which produces testicular feminization. Such an individual is phenotypically female, although geotypically male, and will never be fertile or achieve full sexual development. Doctors traditionally keep knowledge of such conditions from patients for psychological reasons. Is a patient legally entitled to know such information? Is a doctor legally entitled to keep such information from a patient?

Legislation in the phenylketonuria case can forewarn us of potential future difficulties. In fact, legislation to screen for phenylketonuria was enacted with insufficient knowledge. The US legislation occurred before the range of variation of phenylalanine concentration. Only the case of a particular enzyme deficiency (phenylketonuria hydroxylase) is clinically significant for phenylketonuria. Cases misdiagnosed as phenylketonuria and treated with a low phenylalanine diet have resulted in physical injury of a normal child from phenylalanine deficiency. In some US states screening legislation did not involve rechecking afflicted individuals. False negatives represent a serious problem.

Another social issue in screening concerns possible occupational discrimination. Certain assays are useful in diagnosing a predisposition for particular disorders. Alpha-antitrypsin deficiency, for example, predisposes individuals to lung disorders. Is a screening program to detect populations which include high risk individuals valid for employers to give to potential employees who would be exposed to grain dust? Should the marketplace be made safe for all individuals? Or should the safest individuals be picked for employment?

Decisions as to what we screen for, in whom and with what constraints are difficult. Some feel that the social cost and institutional care for seriously afflicted individuals warrants interference with individual choice concerning procreation. Who can make such a decision? On what basis? Research into ways of examining such questions is needed.

One contributing point to remember here is that a decision to allow free procreation of individuals who will produce severely defective offspring is an allocation of resources both financially and often medically, away from other possible goals.

The workshop on genetic counseling and screening focussed on prenatal diagnosis.* This fast-developing area is of immediate concern as increasing demand and limited resources are forcing decisions as to who should receive the benefit of these services. To date members of the medical

*Proceedings from this workshop should be available shortly.

care system are deciding in an ad hoc fashion. One prenatal diagnosis centre which is operating at capacity has elected not to publicize its services despite the low proportion of high risk cases being reached. We might wish to consider whether this is the best solution to allocation of resources.

Workshop participants from a wide range of disciplines considered the current Canadian state-of-the-art of screening and counseling with respect to prenatal diagnosis (existant facilities and services, criteria for receiving services, monitoring and delivery of care, etc.). The discussants looked at current practices for decision-making in this area and possible ways of improving the system.

The workshop raised many points of interest. One of special importance in establishing research priorities is that no characteristic structures for illuminating the complex problems seem to exist in Canada. Britain has interparliamentary committees. The US has Health and Welfare supported Task Forces and discussion groups as well as Senate Committees. In Canada, the LaMontagne Committee is notable as an exception. The MRC set up a temporary working group to devise guidelines but this has now been disbanded. Canadian Health and Welfare or the Royal Society could provide a forum for lawyers, scientists, ethicists and others, but do not. Similarly, the recently formed College of Medical Genetics might foster such work, as well as provide a resource base for revising guidelines and for eliminating some of the current duplication of efforts. The provision of such forums seems important. Research on why comparable Canadian institutions limit their own mandates and do not consider broad based issues and how to promote such discussion seems desirable.

Another important point to emerge from the workshop concerns communication. Inadequate two-way communication between public and genetics centres, between general practitioners and geneticists, among geneticists themselves, prevent optimum delivery of care in the genetics area. The genetic education of the general population and of the professional population also requires improvement. Research into the best way to do this is desirable.

The case of genetic screening and counseling is a prototype of the general health care and ethics issues. As H. Jack Geiger (Professor of Community Medicine, City College of New York) said "How much of what is enough for whom and who says so?". The meeting where he said that considered the role of expertise in decision making.

"Edmund Pellegrino (a physician and President of Catholic University of America) presented the problem as one of distinguishing between facts and values. Expert testimony is needed, he said, about both facts and value choices involved in any proposed policy change so that a deliberative body such as a

legislature can make sound decisions in the public interest. But it is precisely this kind of expert assessment that we now lack. The economic data currently available about health care costs are very weak, and the information about value preferences is even weaker. Pellegrino concluded that we do need technical experts of two kinds - one dealing with the economic issues and one with the biomedical questions of effectiveness."*

These questions will be among those I examine in the study paper on bioethics. The determination of economic data and especially of information about value preferences is important. For accountability we need ways to evaluate public concerns, to determine public response to risk criteria.

The bioethics paper will consider as well whether women have a special point of view and deserve a special forum in the area of reproductive technologies. A look at why men generally make policy for people is needed. It will also consider the relationship between science and values. The view of science as objective and value-free and of values as science-free is changing.

"We have left behind the view that science is value-free. We recognize the links that exist between many areas of science and our values and ethics. We are ready to benefit from the insights that science can bring to our understanding of these values. ... the pure poles of 'value-free science' and 'science-free values' are diminishing in strength. But living on this particular slippery slope will require extreme caution. ... we should guard against a possible future period in which we might fall into one of two possible different errors: the attempt to explain values exhaustively in terms of a science that is always incomplete, or the attempt to attack all science as being intrinsically value-laden.

"Avoiding these extremes, much valuable work remains to be done. We need to examine the internal concepts of science. ... to find how we might analyze the connections of the sciences with the foundations of ethics. We need to study more thoroughly the importance of genetic evolution for understanding our social behaviour. We also need to re-examine the history of science to see where science-value interactions have occurred

*Page 10 in "Ethics and Health Cost Containment Research Agenda", reviewed by Carole Levine, Hastings Centre, Report 9: 10-13, February 1979.

with important social effects, even though some of the concepts were, from our present point of view, faulty (the history of eugenics, the attempts to link quantum mechanical indeterminacy with concepts of free will, the relationship between Marxism and science, the relationship between religion and science). And of course we need to explore the ethical dimensions of present scientific research procedures and technological practices. By pursuing these different approaches we will learn much more about the great variety of ways in which science and values can interact."*

The question of science and values introduces another anticipated paper, one which will examine the science court proposal. The science court as Dr. Arthur Kantrowitz describes it would attempt to separate scientific fact from value in so far as possible. Hopefully this would encourage development of scientific consensus. The anticipated paper will also explore other possible mechanisms for resolving scientific controversy.

A paper in progress related to this third theme takes a retrospective and anticipatory view of psychology in policy formulation. It is examining the use and introduction of psychological knowledge into eugenics, 1900-30, and into mental testing, 1915-30. Current policy focusses on behaviour modification in the classroom. As with genetic screening for phenylketonuria in this country, no formal decision seems to have been reached as to a policy to introduce behaviour modification. Questions of informed consent and of whose interests are to be served (student - parent - school system) are of interest. The paper also asks what review of the process does/should exist. A broader examination of values accepted and encouraged in current psychological counseling would be worthwhile.

Another issue under assessment by Science and the Legal Process is confidentiality and the whole access to information question. An annotated bibliography defining work being done in this area and problems around privacy and confidentiality will help us determine if a paper in this area is desirable.

This informal essay has drawn a broad picture of work in progress for Science and the Legal Process. Several explicit and many implicit research areas are remarked in passing. The answers are few; the questions many. This work is in process. We are not sure how many of the questions can be answered. Many

*Graham, Loren R., "The Multiple Connections Between Science and Ethics", Hastings Centre Report 7:35-40, June 1979.

of the questions can be seen as arising from a reassessment of values in a changing world. A recent article I came across equated a changing world with a badly confused world. Perhaps our workshop and the SSHRC can assist in allaying some of the confusion.

ETHICS, LAW AND FOUR QUALITY OF LIFE ISSUES

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This paper will be little more than an outline, and will consider its subjects from two related perspectives, the ethical and the legal. I do so for two reasons. The first and less important reason has to do with my own fields of interest - ethics and law, and my present position - that of directing a biomedical project for the Law Reform Commission of Canada in which project ethics and law have almost equal weight. The more important reason is that in my view these two perspectives are in fact related and both should be more explicitly included in any research done in the biomedical context (and other contexts) than is usually the case.

1. The Interaction of Law and the Value Sciences

In fact the subject itself of the general theory (and implications for policy formulation) of the interaction of law and the value sciences should, I think, be an integral aspect of any future research programme in the area of science, technologies and human values. Unless there is more attention paid in research and policy making projects to the interaction between law and the value sciences (i.e. philosophical ethics, theological ethics, etc.), we risk widening the gulf between them and perpetuating a distorted image and function of each. If law and law reform (including "quasi-legal" guidelines, public policies, etc.) is to be more than legalistic and uninspired rule-making, it needs to be informed by the preoccupations and concerns of the value sciences - meaning, purpose, responsibility and commitment to values. But on the other hand, if the value sciences are to transcend the image and function of purveyors of formalized doctrines and all-embracing norms and concepts too little related to concrete situations, they in turn need to be informed by and rooted in the concerns of law - the present and future allocation of rights and duties, the (principled) resolution of actual and future conflicts, the creation of processes and channels of cooperation.

Not that law and the value sciences have identical concerns, or that their interaction in a context such as the biomedical one will always be smooth and friendly. Far from it. There is and should be a degree of distinction and tension between them; but it is at least arguable that they need each other - law to remind the value sciences of the concrete social dimension, and the value sciences to help give law its direction and spirit.¹

Much of law is of course merely regulatory and without any perceived or perceivable moral content. But the growing uneasiness of many in the face of the multiplication of these merely regulatory laws, and with seemingly reckless abandon, may itself be a confirmation that ultimately, and at least about serious matters, we expect law to be a fundamentally moral system. If there are too many laws which underline or refer to no particular values at all, or if the values underlined and enforced sometimes suggest that the involvement of law is selective or biased, or unresponsive to an evolved morality (all within the context of an exploding technology), then the gulf between law and morality widens, law risks being reduced to amoral "ad hocery" and morals to private religiosity with no public dimension. Lord Devlin may have been wrong about how law and morals are related, but not wrong in arguing that they are (at least ultimately) related.²

Another somewhat different (and in some respects more comprehensive) way of arguing this need for a new interdisciplinary approach to biomedical issues would be to argue for the involvement of the normative, descriptive and predictive disciplines in a new discipline. One expression of this view begins by noting that,

"We now realize that our normative disciplines are increasingly incapable of bearing insight into problems of medical ethics. We simply do not know how to think ethically about man in dynamic life situations complicated by technology. The value sciences - philosophical ethics, moral theology and theological ethics - all approach man in his pre-technological simplicity or in philosophic abstraction.... If this is true, then we urgently need a new discipline that will explore the new kinds of problems implicit in the technological advance. This new discipline perhaps might be an interdisciplinary quest for the structures of responsibility. This endeavour must encompass the wisdom of classic humanistic insight, plain common sense and a lively new study of the future.... It will involve the normative, descriptive and predictive disciplines. Van Potter reaches in this direction when he calls for the discipline of 'Bioethics'."³

While the "discipline" of bioethics is by now relatively well entrenched and recognized, few would claim that it has in fact successfully integrated into its methods and concerns the "normative, descriptive and predictive disciplines", or that it

has successfully recognized and promoted the methodology and goal I suggested earlier, namely the interaction between law and the value sciences. In this regard at least the discipline is in its infancy and there is yet much growth to be hoped for. Hopefully this crucial methodological and interdisciplinary aspect of biomedicine, as crucial to the legal as to the ethical articulation and resolution of the issues, will be made one of the research priorities in any future Canadian research program in this area.

There are three further issues which in my view ought to be major priorities in further biomedical research and policy-making. If the "interaction" or "interdisciplinary" point just made is a partly methodological one, these three are more in the nature of substantive issues. Yet all three at the same time are probably examples and victims of a general lack of meaningful interaction between law and ethics; in some respects too much law without enough ethics, in other respects too much ethics without enough law, and in still other respects not enough law or ethics. Issues as these:

- 1) Quality of Life and the
Cessation of lifesaving/prolonging treatment.
- 2) Quality of Life and
Genetic counselling/engineering.
- 3) Quality of Life and
Environmental pollution/hazardous products.

They each of course raise some very different questions and challenges both for ethics and for law, and they are far from being equal in the individual and social (or microethical and macroethical) implications they raise. But they have at least two things in common which suggest the appropriateness and even the urgency of considering them together under the roof of one paper. In the first place they all invite a discussion and a (not yet achieved) resolution of the implicit sanctity of life vs. quality of life debate which lies behind them all at the most fundamental level. And in the second place, thanks to galloping technological advances, all three issues have drastically and dangerously outpaced both the ethical reasoning ability of our value sciences, and the conflict resolution/allocation of rights and duties functions of our law. In short they are all proof that our technological reach has exceeded our ethical/legal grasp.

2. Quality of Life and the cessation of life saving/
life prolonging medical treatment

Both law and ethics tend to be at best ill at ease in dealing with the quality of life concept or quality of life criteria applied to the cessation of life saving/life prolonging medical treatment of defective newborns or terminally ill adults. It is often assumed that both law and ethics would have to abandon a commitment to the sanctity of life principle if the validity of some quality of life concerns were to be recognized, for instance by affirming that a brain dead but (merely) biologically alive body is in fact a dead person; or by explicitly condoning some forms of cessation of life saving or life prolonging treatment for "quality of life" reasons.

It is certainly the case that, at least in the medical arena and when life and death and integrity of life decisions are directly at issue, legal theory (as expressed for instance in the Criminal Code) has an essentially "vitalistic" understanding of the sanctity of life principle. In varying forms and to varying degrees, this "vitalistic" interpretation considers the sanctity of life principle and the quality of life concept as opposed and mutually exclusive. The implicitly vitalistic interpretation of the sanctity of life principle commits much of legal theory to insisting that medicine maintain human life itself, no matter how minimal the level, no matter the condition (or "quality") of the life in question, no matter the level of suffering or the likelihood and degree of recovery.

As for medical ethics and medical practice, there is still little consensus and much disagreement about whether and how to reconcile or choose between the sanctity of life principle and quality of life criteria in this context of life saving and life prolonging treatment. There is in other words a continuing and urgent need for more research, public debate and agreement on this issue within the value sciences and the health professions if laws and other forms of public policy are to be adequately informed and reformed by the sort of interaction encouraged earlier in this paper.

For one group of ethicists and commentators the sanctity of life principle and quality of life criteria remain irreconcilably opposed. For them, quality of life thinking inescapably threatens the "absolute" value and meaning of human life insisted upon by the sanctity of life principle. The latter principle is seen as absolute, objective and protective of all human life whereas quality of life criteria are seen as merely subjective value judgements about the "relative worth" of lives, and if any such criteria were to be adopted, all human life would be threatened.

Another group of ethicists and commentators make the opposite choice, and argue that the sanctity of life principle has more or less outlived its usefulness in the face of both the complex moral problems raised by sophisticated medical technology as well as the moral evolution of our times. If it has not outlived its time, (so it is argued) it is at least too vague and general to be of any practical use in guiding moral decision-making or the formulation of public policy.⁴

There is still a third possible view, and it is one I have defended and explored at some length in a recently published book, Sanctity of Life or Quality of Life, in the context of ethics, medicine and law.⁵ In this view, for ethics, medicine or law to acknowledge and articulate the validity of quality of life concerns need not threaten our society's traditional commitment to the sanctity of life. On the contrary, to acknowledge and incorporate quality of life factors in law and other forms of public policy related to life and death medical decision-making can in fact be a reasonable and necessary expression and defence of the sanctity of life principle itself.

To argue that the sanctity of life principle alone is the unique and sufficient decision-making tool seems to ignore several realities. In the first place, it is an abstract principle. Its great and abiding value is in reminding us that human life is precious, that it is worthy of respect and protection and that human worth is not determined merely by subjective or utilitarian concerns. That is why the principle remains a necessary decision-making tool. Because human life (and all life) is fragile and precious it needs all the protection it can get. But as an abstract, indeterminate principle it cannot be sufficient by itself to answer all complex moral questions in advance. Abstract principles can (and must) test and evaluate moral rules or specific criteria,

but they cannot replace these latter. And without rules capable of evolution and reform in the face of new facts, new data, there could be no ethical reasoning.

The sanctity of life principle can draw attention to the sanctity of human life, and insist that human life not be taken or allowed to die without justification. That is why it should not be dropped. It is needed. But it leaves unanswered questions such as, what is human life, what are its signs, what are its characteristics, can it be so deteriorated that it is no longer to the patient's benefit to maintain it on a life support system and therefore is it justifiable to allow it to die? Evolving empirical data and medical technology are raising inescapable and fundamental questions about "quality" as never before. For instance the ability of life support technology to halt and hold the dying process sometimes indefinitely at almost any level of life down to the merely biological almost forces us to ask questions such as whether we are faced in certain cases with real human life or apparent human life, and forces us to re-examine moral rules such as "do not kill" or "do not allow to die".

It is not as if quality of life decision-making in these issues is not already being made in practice by doctors and families. It is. But whatever criteria are used, they differ from doctor to doctor, from hospital to hospital, from family to family. There is little public debate and even less public policy. Quality choices related to technology may have been less pressing and more avoidable in a simpler age, but now in more and more cases, not to choose is to choose. To avoid principled choices between competing technologies and social policies, choices made partly at least on the basis of the different qualities of living and dying they promote, is often in effect to choose the least desirable, the least moral - if not for this generation, then the next. If the "quality" choices are made by default by the technocrats and bureaucrats, because the rest of us assumed it was enough to occasionally burn incense before the "altar of the sanctity of life", then we have misunderstood both that principle and our responsibility. Personally, I am convinced that it is possible to purge these quality of life criteria of connotations of "relative worth" or "social utility", and to focus them on objective criteria used exclusively for the benefit of patients, for instance the unconscious terminally ill or the seriously defective newborn, at times deciding in favour of continued life support, and at other times against it.

It is arguable that there are two such quality of life criteria which meet these standards, that is which are objective, focused on patient benefit, avoid the pitfalls of "relative worth" or "social utility", and are essentially expressions of the sanctity of life principle itself. The first considers the patient's capacity to experience, to relate. The second considers the intensity and susceptibility to control of the patient's pain and suffering. If, even with treatment and loving care, a reliable diagnosis and prognosis indicates that there is not now and apparently never will be even a minimal capacity to experience and relate, or if the level of pain and suffering is or will be prolonged, excruciating and intractable, then a decision to cease or not initiate life supporting or life saving treatment for an incompetent or non-competent patient could be beneficial and acceptable.

No inequality between lives need be implied in these criteria. All persons are equal in value no matter what their condition or quality. But not all lives in the biological sense are of equal value to the patients in question. To cease medical treatment is not unjust discrimination. Death need not always be resisted as if anything is an improvement over death.

In my view there is an urgent need for a great deal of research and debate on the substance and implications of quality of life criteria, in the context of both the value sciences and law, and in the matter of their interaction. The research should be on a number of fronts - ethical, medical, sociological and legal, - but the most pressing need right now is for both regional and localized task forces in which all those components work together and as much as possible in empirical or working contexts in which principles and priorities can be evolved and tested in dialogue with the experience, responsibilities, needs and insights of both patients and health professionals.

Working contexts ideally suited to this kind of interdisciplinary research on this quality of life issue would be general hospitals and children's hospitals, intensive care units, emergency care units, palliative care units and home care nursing services. Out of more such combined normative and empirical research would hopefully come more examples of explicit and publicly accessible treatment guidelines incorporating quality of life criteria.⁶ It is

not inconceivable that a given set of guidelines emerging from such a process could occasion sufficient professional and public debate and acceptance that they could adequately satisfy, clarify and protect the rights of patients, the liability and rights of health professionals and the interest of the public, thus obviating the necessity to enact new legislation or reform existing legislation. On the other hand, such research and guidelines could inform, complement and influence the direction and substance of any new or reformed legislation, and provide courts with a clearer and more substantive statement of exactly what both the health professions and the public regard as the standard of "reasonable care and skill" for treatment decisions involving the terminally and seriously ill as well as the seriously defective newborn.

3. Quality of Life and Genetics

There is another urgent issue which raises fundamental health and quality of life questions, and invites further interdisciplinary research, debate and resolution from ethical and legal perspectives. It is the cluster of subjects which could be grouped under the headings of genetic engineering, genetic screening and genetic counselling.

It has been observed that we are faced here with a group of technologies and practices which are in a decisive respect unique - the object upon which they operate is man himself, and not just the tools man uses or the conditions in which they are used.

Events in this field have a habit of moving much faster than our reasoned judgements and controls. An example might be in order. Fundamental questions in ethics and law about the personhood, rights, or quality of life of the fetus fertilized and grown "in vitro" were (and are) still being hotly debated. The debate was largely a sort of "what if" debate. But while it was going on and still far from resolution the first successful reimplantation of such an embryo into a woman took place (last year) and was upon us, thus doing a successful end run right around the debate. Being left standing all alone at the starting gate is becoming an all too familiar posture for ethics and law.

It may not be possible to maximize all the benefits. We may have to make some hard and principled choices between the various goals these technologies make possible and implicitly promote. For instance we attempt to control population by controlling fertility, but on the other hand and at the same time we develop other techniques to enable infertile women to bear children. On the one hand we try to extend the lives of those with genetic disease, but on the other hand and at the same time we hope to eliminate defective genes from the population.

Another ethical and social issue in this field is one of distributive justice. How ought these scarce resources to be distributed justly. Assuming that demand will always exceed supply, who should have the benefit of genetic therapy? Are some people, or ages, or racial types more worthy, and if so on what grounds?

Still in the area of potential abuse of power and dehumanization, is the fundamental quality of life question, what is to be considered normatively human? What should we value about human life? What is the relation of the empirical and descriptive elements to the ethically normative elements? Neither a cost benefit analysis nor the results of an amniocentesis test can answer by themselves such questions about what is to be normative. In our attempts to diagnose and cure defective genes, or to counsel those who have defective genes or carry a genetically defective fetus, what kind of human, what level of genetic health is to be the goal, is to be protected, and at what level of defect are we to cease our efforts and to counsel non-conception or abortion? What level of genetic imperfection ought we to tolerate or not tolerate?

Two further issues raise urgent questions for both ethics and law. One concerns the relationship of genetic defects of potential parents and their right to procreate (a "negative" eugenics question). The other concerns the relationship between fetal defects and abortion (a "positive" eugenics question). Should the state have the right to forbid procreation (for instance by refusing marriage licences) to couples about whom there is genetic evidence that their offspring would likely be defective, on the grounds of protecting the potential child from "wrongful life" and/or on grounds of potential costs to the state? Or should such

couples be allowed to marry and procreate if they wish but be encouraged to recognize a "genetic responsibility", especially to the potential child, not to procreate. Perhaps by education and persuasion rather than by laws and sanctions, the sort of "genetic roulette" involved in procreating regardless of this information could eventually be seen as almost as reprehensible as state eugenic programs forbidding imperfections and therefore some procreations.

As for the relationship between fetal defects and abortion, there is a discernible shift in both ethical and social policy debate and proposals. The issue used to almost exclusively consider whether the mother had the right to abort in such cases for the benefit of the fetus, and the mother and perhaps the family. But now, "There are an increasing number who would argue that even if an individual couple is willing to run the risk of bringing a defective child into the world, and to bear the psychological burden of caring for it, it would nonetheless be anti-social of them to do so."⁷ In the way these matters evolve, it is a small jump from thinking it "anti-social" for mothers not to abort a defective fetus, to the state proposing policies which insist on abortions in these cases.

But the other side of the coin can be seen in the matter of suits for "wrongful life" initiated in recent years in a number of jurisdictions, on the grounds that life itself in some circumstances constitutes an injury to the new born and living person. The basic moral and legal question is whether it may be an injustice to a potential child known by ante-natal diagnosis in its fetal stage to be severely defective, to cause or allow him to be born. It has been argued in these torts that when great and intractable suffering or harm can be predicted before birth for the child once born, life itself could be considered not a gift but an injury, and there may be a duty not to give that person existence.⁸

One very concrete context in which this complex question is already faced frequently is within the role of genetic counsellors. Some (for instance Peter Reilly⁹) feel that the genetic counsellor ought to remain neutral about whether or not a pregnant woman with a defective fetus should have an abortion, merely pointing out to the woman or couple

as dispassionately as possible what are the results and risks of the tests and the alternative next steps. Others argue for a more aggressive role for genetic counsellors, and in the direction of urging abortion.¹⁰

As for the role and justification for law in this issue, most of the same questions raised earlier about law in the context of "allowing to die" decisions are also relevant here. It is generally conceded that the past role of law in genetics has often been far from a positive one. This is perhaps especially the case with genetic screening laws in the past. In both Canada and the U.S. they have often proven to be both discriminatory against certain sections of the population and ineffective in achieving their stated aims.¹¹

On the other hand many of the issues I indicated earlier seem to call for and even cry out for public policy resolution, and perhaps in the form of legislation or law reform. It may well be that, "The law is the best forum we have for exploring, arguing and resolving such complex issues. Moreover, it is often to the law that the perplexed parents and physicians look for guidance."¹²

As for the role of the courts, here too law can make an important contribution to our society's identification and evaluation of the values presently implicit in science's decision-making.

"Courts, standing outside both scientific and political debate, can help to make sure that decision-makers articulate the basis for their decisions. In the scientists' realm - the sphere of fact - courts can ask that data be described, hypotheses articulated, and above all, in those areas where we lack knowledge, that ignorance be confessed."¹³

4. Environmental Pollution/Hazardous Products

In this issue as well, there can be readily identified a high priority need for research, debate and resolution of a great number of health related quality of life questions. Here too an interdisciplinary approach, including the interaction of value sciences and law would appear to be indispensable.

Concrete and urgent pollution/hazards problems are many and growing. All of them point up to one degree or another a scarcity of both conceptual and normative certainty and adequate controls and sanctions. Whereas the primary context and focus of the previous quality of life issues dealt with in this paper was medicine, in this issue it shifts to include industry as well. The interest remains the same however - the quality of life and health.

Specific lists and evidence of pollution/hazards problems affecting human health (either directly, or indirectly via environmental destruction, ecological imbalance and animal and plant life damage) are no longer found only in specialized journals or at esoteric conferences. Any and every daily newspaper now presents us with a steady stream of stories describing how we are successfully and valiantly winning battle after battle against both the environment and health, even against heavy odds like respect for nature and the quality of life, and good old common sense. A short list might be illustrative:

- 1) It is estimated that about 90,000 commercially used chemicals, most of them potentially dangerous to health, are presently unregulated and the number is growing fast. Only a tiny fraction of industrial chemicals are presently regulated.
- 2) It is estimated that one type of pollution source alone, acid rain, has already caused about 40,000 Canadian lakes to be severely polluted and beyond recovery. Oxides react with water in the atmosphere and produce sulphuric acid, a corrosive agent which attacks lung tissue. Some estimate that by the year 2000 the southwestern Ontario "breadbasket" could look like the Sudbury basin if this type of pollution goes on unchecked at present levels.
- 3) A great deal of environmental pollution and hazardous product danger is transboundary -- it crosses national and provincial boundaries in both directions. For instance,

as an almost certain result of fluoride emissions into the atmosphere by a New York aluminum plant, the children of Cornwall Island in Ontario are showing serious symptoms of fluoride poisoning.

- 4) In the use of many chemicals and other hazardous products there is a degree of uncertainty and unpredictability about the fact and extent of adverse short and long range effects on the environment and human health. But in many cases there is near certainty that there will be some adverse effects on future generations of human, plant and fish life if the present levels of hazardous emissions or resource consumption are not seriously restricted and in some cases prohibited.
- 5) It is (technically) relatively easy to regulate identifiable single chemicals or other hazardous products. But mixes of chemicals or combinations of pollution sources are much more difficult both to identify and to regulate, though often in the aggregate much more harmful to environment and health than single chemicals or single sources.
- 6) The problem of disposal may be further from solution than ever. Seepage of some hazardous chemicals and contaminants thought to have been safely buried years ago is now surfacing and threatening ecology and human health. No safe way has yet been found to dispose of some of these substances. Many will remain contaminating for thousands of years. In many cases no clear records even exist as to where contaminants have been dumped in the past.

- 7) A large percentage of deaths and health problems result from occupational health hazards. For instance, 20% of Canadian deaths annually are due to cancer, and it is estimated that 60 to 90 percent of these are occupationally related. Women who work with lead, mercury and other hazardous chemicals risk damage to their reproductive systems and to fetuses. Much of the damage appears only years after the occupational exposure has begun, and much of it (because mutagenic) may also affect the offspring of those exposed.
- 8) The air, earth, water, plant and animal life around us is often referred to as the life-support system of this and future generations. Biologists and others maintain that much of that system is rapidly being contaminated beyond repair, and its resources being used up beyond the point where they can be renewed. We may be rapidly and blindly "pulling the plug" of our and future generations' life support systems.
- 9) Many argue that present (legal) regulations and sanctions are not only ineffective but counter-productive. Because the many detailed regulations, administrative bodies, procedures and inspections give the "impression" of protecting health and environment without in many cases actually doing so, the introduction of cohesive protections and tougher sanctions is further delayed.
- 10) It is often argued against stricter environmental controls and enforcement that the cost would be too high in economic terms -- lost jobs, reduced profits, moved industries, etc. Industries often pressure governments with such arguments. Partly at least as a result of such pressure, most Canadian pollution standards seem to be based on "best available technology". In the United States on the other hand there are at least some examples of standards made high enough to require not only the installation of existing technology, but which have forced industry to invent better control technology.

- 11) It is sometimes assumed that there is little or no public interest in environmental pollution matters. But in fact a recent Canadian survey indicates that 89% of Canadians consider deterioration of the environment to be a major concern; 87% are ready to change their consumption habits to curb resource waste and help fight pollution; 75% are ready to pay more for products which pollute less, and 57% are willing to pay more taxes to clean up air and water. About 65% surveyed say they are more concerned about the quality of the environment than they were five years ago. 14

There exists of course a great deal of environmental law, under both federal and provincial jurisdiction. 15 These laws could be classified within four broad categories: those which regulate potentially harmful conduct (such as waste handling and the production of waste); those which encourage the development of alternative technologies; those designed to produce the information needed to make good environmental management decisions; those which provide for compensation for people harmed by environmental degradation.

As for criminal law power in the arena of environmental law, it is potentially and in theory almost unlimited, but in practice there is at the moment relatively little direct criminal law involvement, and there are at least two limitations on Parliament's ability to legislate in this area by making new "environmental" crimes. The first is that Parliament has not been allowed to invade areas traditionally within the provinces' jurisdiction. But many think it unlikely that the courts would refuse to allow new federal efforts (under its criminal law power) to prohibit environmental pollution. After all, the role usually ascribed to criminal law is that of preventing people from engaging in conduct harmful to others. A second limitation involves the sort of remedies or sanctions available to criminal law -- that is, trial of the accused before courts and the imposition of a fine or imprisonment on one found guilty. It is as yet unclear whether courts might allow more flexibility for "environmental/hazardous products" crimes -- such as stop orders, advance rulings, civil remedies, injunctions and so on.

It is sometimes suggested that given the seriousness of acts of environmental pollution, and the weakness of present regulatory sanctions, the Criminal Code should be expanded to explicitly include environmental "crime". Apart from references to a few particular substances and dangerous weapons, the Code makes no direct or cohesive reference to the problems and dangers referred to earlier. Yet as also noted, in our society and times there appears to be an increasing awareness that environmental damage seriously harms the health and well being of many, and that our fundamental values are thereby seriously contravened, values such as the sanctity, health and quality of human and all other forms of life.

That being the case the question arises as to whether at least some of the acts in question should not now be classified as real crimes rather than merely regulatory offences. Clearly law invites disrespect when acts no longer considered wrong nevertheless remain sanctioned in the Code. But if the Code requires pruning on some issues, it may require additions on some other issues. A number of existing sections in the Code could perhaps serve as "anchors" for revisions and expansions to include environmental matters; but what is equally or more likely is that various concepts, principles and definitions of the present Code would have to be expanded and revised as well. It is hardly surprising, given the age of our Criminal Code, and that it predates by many years the present and growing sensitivity to environmental matters and responsibility, that its underlying philosophy for the most part is "privitistic" and "individualistic". It is particularly in aiding such a possible evolution and expansion of the legal principles and concepts that the value sciences could play a central and integral part.

For instance the crimes of theft and mischief are apparently presently applicable exclusively to private property. But theft as "taking or converting private property, or oysters" (s.284), or "specimens of ore" (s.293), does not in most instances seem nearly as wrong as "taking or converting" air, rivers, streams and forests by means of resource prodigality or the abusive use of chemical contaminants. If one were to include the "theft" of our common environmental heritage, the meaning of theft and the meaning of property would clearly have to be expanded. In s.387 of the Code, one who commits mischief is one who "wilfully destroys or damages property,

renders dangerous, useless, inoperative or ineffective...". It could be that for purposes of environmental abuse, in this and similar sections the underlying distinction between "my property" and "other peoples' property" could be set aside or re-defined. Serious pollution of any property, private or public, owned by oneself or another or an industry or the State could perhaps be viewed as mischief and a crime when pollution of that land, water, forest, etc. will seriously and harmfully affect the well-being, health or quality of life of others in this or future generations.

As far as private law is concerned there remains a number of serious obstacles to fully adequate and just protections and remedies in environmental matters. One of these is the issue of burden of proof. The problem arises because in given instances there is very often some evidence of risk or damage, but it is often difficult if not impossible to prove that a risk will result in damage, or that a particular ecological or health damage is traceable to a particular act, offender, or chemical. There is often and inescapably a large quotient of speculation involved. The following citation is one view of this problem and the result:

"Of course we live in a system of laws, but it is a loaded system.... For even in a world with rules against resource consumption (against for example pollution), the leverage inherent in resource consumers means that they can continue their conduct until sued. In short, they will almost inevitably be defendants, and those whose uses preserve rather than deteriorate will inevitably be plaintiffs. And it is one of the simple facts of our present system that ... plaintiffs must generally carry the major burden of proving most of the basic issues in a law suit. The result is striking: even with a system of substantive rules against resource consumption, our present rules ensure that in cases of doubt about any facet of those rules, resource consumption will prevail."16

Various solutions have been tried or proposed in a number of jurisdictions. One of these is the obvious and extreme one of shifting the burden of proof to the manufacturer of every new industrial chemical, obliging him to prove that the substance is not dangerous before it may be used. In

Canada the burden has already been shifted in that direction in the case of drugs regulated under the Food and Drug Act. Another "solution" is that adopted by many recent United States statutes and court decisions. A risk-benefit approach is used which allows courts to use a flexible standard of proof. The degree of certainty required varies according to the gravity of the alleged harm and the benefits of the defendant's (or accused's) activity.

A second legal difficulty is that of obtaining information on actual or potential dangers to environment and related dangers to health. This difficulty applies both to government agencies trying to get information from manufacturers and to the citizen trying to get information either from industry or government.

A third difficulty in private law protections and remedies in environmental matters has to do with standing to initiate a civil suit. At present a plaintiff must establish that he has suffered injury peculiar to himself, and not merely a harm common to the general public. Since one must demonstrate a private economic interest in a decision, members of conservation groups or associations or clubs do not normally therefore have standing unless their private rights are affected.

A fourth legal difficulty with serious ethical and social implications has to do with harm to future generations. Present law does not seem at all equipped to handle this danger. One commentator writes:

... standards are created in terms of what the present generation can tolerate, and readjustment only occurs in an after the fact manner. The ramifications for, and the long term effects on the quality of life ... which future generations will inherit does not receive sufficient consideration in any system based on standards of permissible environmental contamination. As a result, the present generation may be unwittingly creating a situation which the process of evolution will not be able to facilitate.¹⁷

This point perhaps more than any other underlines the need to evolve new or modified legal concepts and processes to fit the needs of environmental protection, rather than continue to vainly try to squeeze this round problem into a square hole. In this regard perhaps the most radical (and effective) approach would be to give serious consideration to one of the proposals of the Canadian Environmental Law Association, namely that Canada adopt a Canadian Environmental Bill of Rights,¹⁸ and/or that, "legal rights be extended to natural objects such as fisheries, lakes and forests".¹⁹ As proposed, the Canadian Environmental Bill of Rights would be applicable at both

federal and provincial levels, would state clearly and explicitly that the citizen has a right to a healthy environment, that governments have the duty to protect the environment from destruction or degradation, and that the first priority before accepting any proposal, private or public, must be the protection of the environment. This proposed Bill insofar as it also proposes mechanisms and procedures available to both citizens and governments, would go a long way towards filling in most of the gaps and solving most of the obstacles indicated earlier. Though of course a Bill could never in itself be a total answer to all the many difficulties, its enactment would appear to be a necessary and excellent first step. Inasmuch as in this issue of environmental protection (as in the other three this paper has raised) one of the first needs is more clarity and agreement about normative criteria and principles, a Bill which attempts to state just those in this context surely deserves serious consideration. A Bill which begins, as this one does, with the words: "Environmental quality should be recognized by law as an inalienable right" can hardly fail to orient and influence both practices and debate in the right direction.

Conclusion

Research oriented toward policy formulation and possible law reforms on the first two issues dealt with in this paper is presently well underway at the Law Reform Commission of Canada within our Protection of Life Project. Three papers from this project have already been published. They are, Criteria for the Determination of Death; Sanctity of Life or Quality of Life; Sterilization: Implications for Mentally Retarded and Mentally Ill Persons. As for the last two issues, the Commission has decided to undertake research on them in a second phase of the Protection of Life project, which will commence in the Winter of 1980. But we at the Commission and in this project obviously have no expectation whatever that our analyses and proposals will be the "last word" on these and our other subjects. Quite the contrary. They will we hope be valuable contributions to the debate and more ethical and legal clarity; but we also hope our research will stimulate and encourage still more research and proposals on other levels and from other perspectives, particularly in an interdisciplinary and "on site" manner. We would of course welcome the opportunity to take part in further such ongoing research projects on these and related matters.

END NOTES

1. For more on this theme, see for instance Harold Berman, The Interaction of Law and Religion, Abingdon Press, Nashville, 1924.
2. See, S. Wexler, "The Interaction of Law and Morals", The Canadian Bar Review, 54, 2, June, 1976, 351-359; Basil Mitchell, Law, Morality and Religion in a Secular Age, Oxford U. Press, London, 1970; Roger Hutchinson, "Religion, Morality and Law", in Peter Slater (ed.), Religion and Culture in Canada, Canadian Corporation for Studies in Religion, 1977, 187-223.
3. Vaux, Kenneth, Biomedical Ethics, Harper & Row, New York, 1974, pp. XV-XVI. See also: Callahan, Daniel, "Bioethics as a Discipline", Hastings Center Studies, 1, 1, 1973, 66-73; and his, "The Emergence of Bioethics", in H.T. Engelhardt and D. Callahan (eds.), Science, Ethics and Medicine, New York, 1976, pp. X-XXVI.
4. The most notable proponent of this view is Joseph Fletcher. See for instance his, "The Right to Live and the Right to Die", The Humanist, 34, 4, July, August, 1974.
5. Keyserlingk, Edward, Sanctity of Life or Quality of Life, in the Context of Ethics, Medicine and Law, Law Reform Commission of Canada, Ottawa, 1979.
6. Examples of existing and recent such guidelines in the United States which have emerged from this kind of interdisciplinary and "on site" research in hospitals are those drawn up for the Massachusetts General Hospital, and the Beth Israel Hospital, also in Boston. See, New England Journal of Medicine, 295, August 12, 1976.
7. Callahan, Daniel, The Tyranny of Survival and Other Pathologies of Civilized Life, Macmillan, New York, 1973, p. 235.

8. In one such United States case for instance, the court ruled that the infant plaintiff could not recover, because, "The infant plaintiff would have us measure the difference between his life with defects against the utter void of non-existence, but it is impossible to make such a determination." Gleitman v. Cosgrove, 49, N.J. 22, 227 A. 2d 689 (1967).
9. See for instance Philip Reilly, Genetics, Law and Social Policy, Harvard U. Press, Massachusetts, 1977, 151-189.
10. Gold, Jay Alexander, Book Review, American Journal of Law and Medicine, 4, 4, Winter, 1979, pp. 397-402.
11. Reilly, Philip, op. cit., p. 37.
12. Gold, Jay Alexander, op. cit., p. 402.
13. Bazelon, David L., "Risk and Responsibility", Science, 205, July 20, 1979, p. 279.
14. A survey conducted for Environment Canada by the Centre de recherche d'opinion publique (CROP).
15. Four of the more detailed publications evaluating Canadian environmental law are these: Franson, Robert T., and Lucas, Alastair R., Environmental Law Commentary and Case Digests, Butterworth and Co. (Canada) 1978; Estrin, David and Swaigen, John, Environment on Trial, (A Handbook of Ontario Environmental Law), Canadian Environmental Law Research Foundation, Toronto, 1978; Franson, Robert T., et al., Canadian Law and the Control of Exposure to Hazards, Science Council of Canada, Background Study No. 39, Ottawa, 1977; Doern, Bruce, Regulatory Processes and Jurisdictional Issues in the Regulation of Hazardous Products in Canada, Science Council of Canada, Background Study No. 41, Ottawa, 1977.
16. Krier, "Environmental Litigation and the Burden of Proof", in Baldwin and Page, Law and Environment, 1970, 105.

17. Rounthwaite and Zweig, "A New Approach to Environmental Protection", unpublished, 1977.
18. See, Estrin and Swaigen, Environment on Trial, op. cit. (note 19), pp. 458-481.
19. Vallentyne, J.R., "Is Governmental Monopoly on Environmental Protection in the Interest of Canadians? In the Interest of Governments? In the Interest of Environment?" in Food from Water, Department of Fisheries and the Environment, Ottawa, 1978, p. 26.

RESPONSE TO JUDITH MILLER

by R.C. Kaill,
Dalhousie University

This paper presents a detailed and fairly thorough examination of problems in the relationship between science and the legal process. It raises several sensitive and critical issues requiring the attention of bureaucrats and legislators concerned with scientific activity. The paper draws its examples chiefly from the fields of biology and medicine.

From the subject title, I would have expected a somewhat more comprehensive treatment of general problems involved in the various interfaces between science and social well-being. Specifically, I would have looked for the following:

1. Recognition that scientific research not only raises problems for government agencies, but the reverse is also true - that government regulations create problems and limitations for scientific activity. Decisions of official bodies influence what research will be undertaken, through control of access to funding. Thus, there is the problem of undesirable political intervention in scientific activity;
2. Analysis of the nature of the problem in areas of social science, such as, economic, sociology, anthropology and political science. In these areas, the values issue is often more sensitive and subtle than in the areas of natural science, dealt with in the paper; and
3. Greater attention to the generic problems in the scientific method related to social and individual values. These matters receive only passing recognition in the final stages of the paper. In particular, there is need for recognition and analysis of empirical and rationalistic biases inherent in the scientific method. The question needs to be asked whether these values accurately represent pervasive commitments within Canadian society, and, hence, to what extent policies indicated by scientific research should be subjected to testing by other criteria.

Generally, the paper is provocative and should provide a good base for further discussion.

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COMMENTS ON
BIOMEDICAL ETHICS IN CANADA

by Barry Hoffmaster

This lucid and at points brutally frank paper presents a penetrating survey of the state of development of biomedical ethical thinking and literature in Canada. It emphasizes the lack of collaboration not only between disciplines, but also between proponents of different schools of moral philosophy. The call for cooperative interdisciplinary research is rendered somewhat less compelling by realisation that, within the field of philosophical and theological thought, moral theories may be developed which serve esoteric rather than integrative purposes.

The theme is convincingly pursued that adequate ethical analysis is dependent upon adequate identification of facts, and realisation of relationships within biomedical decision-making structures. Study of fact identification and of decision-making processes is a pre-condition to informed ethical assessment; uninformed assessment can scarcely be ethical, and inadequately informed assessment is contentious beyond resolution. The conduct of appropriate studies is a matter less of philosophical contemplation, however, than of empirical sociological and perhaps psychological enquiry. Accordingly, the development of ethical study appears to be a secondary priority to the pursuit of empirical study, without which ethical clarification is circumscribed or rendered futile. The sponsoring of studies to identify critical facts and relationships in biomedical decision-making would be of service to more than ethical analysts, since results of such studies would be of concern to the health care professions, political and social scientists, health economists, lawyers and, for instance, administrative analysts.

While empirical study appears to be primarily the domain of the social scientists and perhaps the psychologists, other disciplines have a role to play. They may not be immediately concerned with methods of data gathering, but should initially state the questions to which they would seek answers, and should be able to interpret the data produced, and comment upon conclusions reached by the empirical scientists. In this way, interdisciplinary or at least multidisciplinary study of biomedical practice may be of value, both to structure enquiries based upon a range of perceived research needs, and to produce data of service to the separate disciplines represented in the study team.

A study of this nature could be distinctly Canadian in a way beyond that achievable by moral philosophy in itself. The Canadian health care delivery system is quite different from that of the United States and, for instance, the United Kingdom, and, while the structure of the medical profession is comparable to that of the U.K., its fee-for-service and provincial health plan funding are fundamentally different. Thus, a potential exists for multidisciplinary data-gathering of a uniquely Canadian enterprise of major concern at individual and communal levels. It offers a prospect of generating a peculiarly Canadian literature, and a Canadian perspective upon problems also experienced elsewhere. Ironically, however, such distinctive data may be of least use for ethical analysis, where analysts are committed to schools of thought proceeding from universal premises; that is, the features of Canadian experience may be subordinated to asserted principles of universal applicability.

In its observation of the prior convictions moral philosophers may bring to bear upon biomedical practices, the paper raises the question of the value of contributing to a struggle for ascendancy among schools of thought not informed by biomedical issues but using them to urge their own philosophical commitments over others. This may refine individual philosophy, and reach a certain degree of consensus upon particular issues, but its useful service to disciplines with related concerns is not obvious, nor is the emerging moral guidance self-evident or convincing. The evolving ethical debate would add to others' self-critical perspectives, however, and extend their perceptions, and these ends in themselves may appear adequate to warrant implementation of studies.

Within these limits, the general research areas proposed in the paper appear appropriate, subject to refinement or development by the multidisciplinary teams whose collective goals the research would aim to serve. In particular, area 2 might prove of particular fruitfulness, even independently of area 1; it would accommodate an interdisciplinary approach, furnish data of analytical and educational value, and address issues of major public and political concern. Similarly, studies in area 3 could serve an integrative function; indeed, in the example given of disposing of the contents of an artificial womb, it is instructive that the author concluded that no legal responsibility might arise, on the basis of law on abortion and homicide, without considering the lawyer's approach to concepts of property and theft. This illustrates, perhaps inadvertently, the need for introducing cross-disciplinary perspectives.

A RESPONSE TO BRAYBROOKE, HOFFMASTER, KEYSERLINGK AND STEWART

Russell Legge

In most of the academic disciplines, there is an increasing awareness of how we human beings tend to get trapped in our conceptual systems, particularly when they give birth to institutional forms, and we find ourselves with a great deal of our self-understanding invested in them. This issue is at the heart of the papers submitted by David Braybrooke, Barry Hoffmaster, Edward Keyserlingk, and Gail Stewart. They are aware of this problem and struggle with the question of what kind of research might be done to help us break out of the maize of inadequate systems (both conceptual and institutional) that we are presently operating under. Professor Braybrooke, as a true philosopher, is looking for some higher synthesis, as he discusses "gaps in our current work" in the field of Ethics and Value Theory, assuming some rational wholeness, and a "coherent doctrine consolidating the topics of preferences, needs, rights, justice, and incentives." This synthesis, formulated by "interdisciplinary", "expert opinion", is not to be rigid; it is to allow for flexibility, compromise, and consensus on a "hierarchy of needs and wants."

I see nothing very different in this suggestion from what we are doing already. We might change the cast by switching some of the roles in the play, but we still have a conceptual system based on a consensus, formulated by experts, that implicitly defines the reality and ideal relationships of the entities in the system and, therefore, their relative value in relation to each other. Such an approach sounds eminently reasonable, and one wonders what the alternative might be, unless it is surrendering to chaos. However, it is also possible that we are stuck in a rut under what might be called a "tyranny of reason," and to continue to push in the same direction might, in fact, increase the chaos that we are experiencing already in our values systems.

This same issue is raised by Edward Keyserlingk's paper, as he discusses the tension between the advocates of the sanctity of life principle and those who prefer the quality of life concept. My hunch is that the sanctity of life people resist the quality of life concept because they sense the dangers involved in having a group of experts (whether academics, legislators, or members of the judiciary) define the desirable and undesirable qualities of life.

Dr. Keyserlingk is at the heart of the issue when he says: "...in the area of potential abuse of power and dehumanization, is the fundamental quality of life question, what is to be considered normatively human?" This is the big question, as was correctly discerned, in my view, in the way you set up the conference. But, no conference or group of persons, regardless of how learned, will give an adequate conceptual answer to it, even though we intuitively know the answer all the time, because it is what we are.

Some of the implications of what I am attempting to articulate are expressed in Barry Hoffmaster's summary of his critique of "traditional moral theory in biomedical ethics" and in his discussion of family medicine.

If I understand him correctly, he is saying that our rational processes in decision-making cannot be detached from those who are affected by them. Such detachment is what leads to what I referred to earlier as the "tyranny of reason." Professor Hoffmaster calls for an approach to medicine that involves a team decision and an important member of that team is the nurse. The reason for his or her importance is that he or she has identified with the humanity of the patient, so ideally, the reasoning is not detached but involves as much of the particularity of the humanity of the patient and the medical team as possible. This is a good paradigm to build on. And, not only is it an area where research needs to be done, more importantly, it must begin to determine how the research is done. This has particular relevance to the university system in Canada.

It is useful to make a bureaucratic distinction between the humanities and the social sciences, but there is a danger that this distinction will delude us into believing these terms refer to two discrete aspects of human existence. Surely our present awareness of the contextual nature of all knowledge implies that the social scientist who is not self-conscious of his particular humanity (which always includes a set of values of some kind) in the research he is doing is overlooking part of the important data, which is a qualifying factor on any of the conclusions he might draw. The same, of course, could be said about the natural and physical scientist.

To say that all knowledge is contextual is not to deny objectivity. Rather, it simply calls for an awareness that objectivity, or the pursuit of objectivity, requires. This is a critical point to remember, as we look for some basic principles to direct our research efforts in a highly sensitive, complex technological environment. In relation to this, Gail Stewart raises the important question: "What shall we attempt?" The answer will depend on who the "we" is who gives it. For this reason, her attempt to move to a very fundamental level with the values questions is significant and it is as tough for academics as it is for any other segment in our society.

It is not sufficient that we simply list a number of ⁴²⁵ areas in which some very bright people might carry out some hard-headed research to see what adjustments need to be made in the present system. Truly human values cannot be determined without becoming deeply involved with human beings. Consequently, our institutional structures must be changed to not only make possible, but to require, maximum involvement of decision-makers and researchers in the lives of those persons who will be affected by their decisions and research.

STUDYING POLICY OUTCOMES FOR GOVERNMENT*

by S.L. Sutherland

A recent book on public policy analysis has as its title the contrast, "The Moon and the Ghetto".¹ The author intends the phrase to suggest the families of complaints about society's uneven economic and political performances across the range of its problems. In an economy which has the resources and the technology to place a man on the moon, he asks why can't there also be safe and clean streets, universal medical care and accessible education, clean and cheap housing and decent mass transport?

His metaphor is, of course, partly about the distribution of wealth and therefore states a pungent criticism of the priorities which are established by the political process. The metaphor is also about intractability; some of the problems of the "ghetto" may never yield to a program of basic research because they are not amenable to technological treatment. Indeed, for some hard problems, it may seem to us after we have investigated and reflected, that any further tinkering will unsettle problems of politics and values which we may wish to leave slumbering. Besides being about establishing proper priorities and finding solutions, therefore, the metaphor is also implicitly about sorting problems into appropriate categories.

The present paper takes up this last concern - the need to sort problems and tactics into appropriate categories. Its assumptions are perhaps paradoxical. They are that social science is weak, that the social science research community lacks both unity and authority as well as demonstrable knowledge; but that social scientists are still the best people to do social science, and that individual social scientists have a moral responsibility to object to the politically-destructive abuse of their methods in the name of applied social research. I retain just enough idealism about the potential of professional social inquiry to believe that the allocation of research money, talent and effort is an important economic and political problem, not least in the symbolic sense.

The purpose of this paper is to sketch the main characteristics of a kind of social science research activity presently being conducted in the bureaucracy, ostensibly as a version of audit, with the effect of limiting public policy. The second part of the paper is a brief and perhaps immodest attempt to reflect on the relations that there might be between these broadly social scientific pursuits and the development of public policy. To avoid confusion, I should state that I have changed my views since presenting a version of this paper last November²: I am now convinced that any such research should

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be broadly directed by political, not bureaucratic or academic actors. The second half sketches the first stages of a procedure which a central politically-directed secretariat staffed with professional social scientists might use to develop a research agenda and to coordinate in-house and commissioned research. The proposal is, quite simply, to sort problems, to articulate current priorities for these problems within categories, to orchestrate and coordinate research, and to provide for a memory, so that we may not only be reminded of our mistakes, but also learn from them.

Social Science for Public Policy

Government at any one time makes use of at least three broad types of information which is generated and labelled as "social science". The distinction between types is made here primarily on characteristics of availability for external review and/or longevity of results. First, there is the body of academic or basic social science, largely generated in the universities in the service of theory. Much of pure social science research is, of course, reported in scholarly publications and is therefore routinely retrievable in libraries and archives. Second, there is a body of applied or problem-solving research. An example is the body of studies which attempt to predict "dangerousness" in mental patients or prisoners so that the minimum appropriate level of security can be provided. Only some of what is done as applied problem-solving research is published or even consolidated and stored in central files, so that it can be re-accessed. Third, there is the growing practice of "program evaluation". Evaluation is a chameleon activity but in essence it claims to be applied research focussed on a program intervention (conceived as an experiment in the real world) to assess whether or not it has met its goal. Very little of the information generated through the study of program interventions is retrievable as interpreted data in "between-covers" reports. That is, program evaluation applies the techniques of social science in one-time "tests" of one-time program interventions, and study results have tended to be ephemeral. A fourth kind of data must be mentioned to avoid confusion: ideally, all three types of social scientific information are interpreted against a rich background of descriptive data - some 300,000 time series by Statistics Canada alone.³

Although varieties of each of these three kinds of social science studies are being pursued at any one time in government, each type has been heavily emphasized in turn during the past 30 years. During the late 1950's and early 1960's academic social science was much favoured. In the United States, the trend is usually centred on the 'Great Society' programs of the Johnson administration. There was relatively little overt value conflict in American society, and it is said that politicians at least, if not social scientists, believed that poverty and racial discrimination were technical

problems which could be solved by technical means. These problems were attributed to an absolute lack of opportunity, not to a relative low position on a social hierarchy.⁴ In keeping with the usual time-lagged diagnostic and therapeutic spill-over from the United States, the Canadian government also accepted that scholarly analyses and studies could improve rationality in government. Prime Minister Trudeau pursued rational analysis, trusting that it would generate levers by which politicians could bestir and control the bureaucracy. However, it was soon conventional wisdom within the American government that academic studies tended to be too pendantic, too distanced, too precise and too late to be of use to most shirt-sleeves policy-making. It was thought that applied social science studies conducted within the bureaucracy to pared-down terms of reference would be, instead, spare, relevant and timely. By the early 1970's it was already accepted in the United States that the grand liberal academic schemes of the 1960's were disappointments. Canadians thus had both the fashion and its reform on their hands at the same time, making for a somewhat tentative embrace of the former. The epitaph of our Government's celebration of academic social science can be said to be the First National Conference of the Social Science Research Council of Canada, held November 1975 in Ottawa. One has only to read the list of titles of papers which were presented to catch the flavour of retreat, if not outright defeat.⁵

In a trend which began in Canada before the turn of the decade, therefore, scientists became bureaucrats in unprecedented numbers in the early 70's. Speaking only of the federal government, a Treasury Board study conducted in 1976 found some 3,500 individuals studying program and policy outcomes for government, their analyses serving as a "withinput" to the Planning, Programming and Budgeting System (PPB) which was implemented 1969-70.⁶ In PPB parlance, each government program was to be supported by an information system to monitor program performance as well as to supply data for reassessments (program evaluations) of the program's objectives and of the appropriateness of the program itself. This information was to be transmitted to the "steersman". This central activity would interpret aggregated program information to assess sectoral progress against a complete and fully interpreted set of social and economic indicators. Whole policy areas as well as individual programs could then be re-planned.

But bureaucratic social science was to flourish only briefly past the heyday of academic social science. The scientist-bureaucrats' lack of success in integrating analysis into the daily business of government is signalled another way: members of the Economists, Sociologists and Statisticians' group are big losers with language teachers in the lay-offs and attrition of the past two years.⁷

The present emphasis is on program evaluation. While following the American quest for rational planning has to date caused little real harm, application of the program evaluation idea in the Canadian

federal context is potentially seriously harmful. It has quite different implications from application in the American government. In general, the use of academic social science by government is seen as an attempt to increase the scope and power of rational administrative activity. This gain is in principle made at the expense of muddle and confusion. Sometimes, of course, seemingly "political" (value laden and intractable) problems will prove to have technical solutions, but shifts from political control to routine administrative control is thought to require open proofs. With program evaluation in Canada, the struggle is over the amount of territory and the kind of intellectual review activity to be subsumed under departmental management, that management being presented as a purely objective financial control. The so-called unitary technique by which the attempt is justified is called "objective program evaluation". But this "management tool" turns out to be merely ad hoc application of social science techniques to determining "the results" of public programs. The programs are conceived of as being experimental interventions into problem areas. The government's policy is the theory, and the programs are the testable hypotheses. In Canada the studies are initiated, conducted, assessed and applied within the bureaucratic framework. They are part of administration. Political power is quite dramatically eroded. When the bureaucracy gains the right to shape, focus and conduct the evaluative processes, it is de facto in control of the "findings", the substantive conclusions which emerge from the activity. Because the activity lacks definition and objective criteria which can be stated before individual applications, control in this sense is largely unconscious and likely benign. But it is the loss of political control which is the point, not individual study outcomes. In the United States, in comparison, reviews of results of programs are political assessments and interventions. They are conducted for political policy-makers in both Congress and the White House, as well as for public assessment. In short, in the American context, "program evaluations" are merely another source of discountable information. In Canada, they are held to generate conclusive knowledge which is also normally authoritative because "administrative" in type.

Audit: An Open-Ended Commitment to Control

The power to initiate and control assessments of political policy has been lodged in the bureaucracy by the efforts of one man, aided by a "progressive" movement in the audit community. The man is of course the Auditor General of Canada, who conducts an external audit of government departments and operations for Parliament as client. He has brought this negative result about by conducting

an energetic campaign for unprecedented investigatory and reporting powers for the Audit Office - unprecedented in kind or quality, not in the coverage of the base of government. This activity pushed the government of the day into lodging a complementary function, the Office of the Comptroller General, inside the bureaucracy itself. This office is to create the products demanded by the Audit Office, thereby staving off complaints and accusations of bad management. The problem is that policy analysis is conducted well away from contact with its proper consumer, the political masters. Program evaluation is a comprehensive form of policy analysis.

The shift has been consolidated in the past five years. Since assuming office in 1973, the present incumbent of the office, Mr. James J. Macdonell, has shifted the function of the office from traditional audit of financial transactions for probity and legality of expenditure to what is called a comprehensive audit. This "audit" is really a multi-faceted examination and review of management. Components of this total review are accessed through the acronym FRAME:⁸

- F - Financial Controls
- R - Reporting to Parliament
- A - Attest and Authority
- M - Management Controls - economy, efficiency and effectiveness
- E - EDP (electronic data-processing)

Only the second and third points are the traditional responsibilities - verification of financial probity and reporting - of Parliament's auditor. The fourth component, "management controls" is the "value for money" audit through which the Auditor General has promised to guarantee "accountability of public servants to the Government and of the Government to Parliament."⁹ The Auditor General gained this unprecedented de facto power to review government programs for their outcomes in comparison to stated goals under the new Auditor General Act, which became law on August 1, 1977. The law states that the Auditor General shall call attention to cases where:

- . money has been expended without due regard to economy or efficiency; or
- . satisfactory procedures have not been established to measure and report the effectiveness of programs, where such procedures would appropriately and reasonably be implemented.¹⁰

This very odd situation, in which a non-elected auditor has the power to call the Government's bluff at every turn, but never himself have his bluff called, seems to be the result of two factors. One is Mr. Macdonell's desire to use the audit function in a creative way. He has wanted to cure government maladministration and misdirection, as he saw it. Traditionally the audit function ends at disclosure of lapses. It then rests with the client for the audit

to devise appropriate corrective action. But Mr. Macdonell wanted to recommend systems to prevent typical kinds of lapses. He further wanted to guarantee response to his recommendations by obtaining the power to audit for whether suitable changes had been made.¹¹ At the same time, it seems to have occurred to the Auditor General that the whole program itself rather than its individual financial transactions was a suitable entity for audit. This relates to the second factor in the equation: the Canadian Government's prior and independent adoption in 1971 of the Planning Programming and Budgeting System framework for presentation of its Estimates of forthcoming expenditure to Parliament.¹²

The problem is that PPB was thought out for application to American government. There, as in Canada, departments develop budgets for two authorities: the legislature which appropriates the public money for the department or agency, and the chief executive. In the American context, both requests are "real"; the legislature can refuse a request for funding which has been endorsed by the executive, and the President can impound congressional appropriations. But in a Parliamentary system, the request for future funding from a department to government (the treasury) is the only "real" request, even that being a negotiation within ranks, and the request from government to legislature is strictly pro forma. It would probably not have occurred to the executive that it could be taken at face value when it began to describe its spending by program purposes, in the Estimates, rather than by votes detailed with the items of expenditure in functional categories. Because the Government dominates Parliament by definition, it is simply unthinkable that Parliament take a firm adversary position and authoritatively demand an accounting of spending against the rhetorical scheme of purposes/programs. Parliament is supposed to hand the money over by votes, its members are to use the program descriptions as aids to understanding government policy and program priorities, and they are to depend on the Auditor General to review the votes' expenditure for probity and legality in order to certify the public accounts. Instead, the present Auditor General demanded the right to audit the outcomes of programs for Parliament. His justification, as already noted, is that there exists an "objective" technique (effectiveness evaluation) which assesses the extent to which public programs have reached the goals for which they were implemented.

The Government of course could not simply allow the Auditor General to investigate its program accomplishments and present a full report card disguised as audit observations for parliamentary consideration. This would amount to pronouncements on policy. Hence the defensive wording of the second clause in the Auditor General Act, cited above. The Auditor General could audit for the presence of satisfactory evaluation procedures, but was not himself to provide substantive comment on policy. In the event this evasion has not proved to have been an effective counter-move. The Auditor General was able to supplement his powers by creating a program review function inside government. He used the scandals over the crown corporations Polysar and Atomic Energy of Canada Limited of 1976 and 1977 as "the smoking

guns which proved to the public, to the Public Accounts Committee and, ultimately, to the government that Macdonell was not posturing ...when he claimed that Parliament had lost, or was close to losing, effective control of the public purse."¹³ These smoking guns scared the vital concession out of the Government: the Office of the Comptroller General was created in 1978. The Comptroller General is chief financial officer for government with responsibility for quality of non-financial "management controls". That is, the Office of the Comptroller General as a new central agency is now responsible for ensuring that government programs are evaluated for economy, efficiency and effectiveness in attaining their goals. The current and first incumbent of the office is H.G. Rogers. Mr. Rogers, is, like Mr. Macdonell, seasoned in the private sector and shares Mr. Macdonell's conception of government departmental activity as similar to the decentralized units or branches of a private corporation. He also shares the view that corporate control can be accomplished by insisting on standardized "bottom line" kinds of productivity measures.

In summary, the Auditor General's "value for money" audit mandate operates jointly with the Office of the Comptroller General's responsibility for ensuring that effectiveness evaluation is conducted. The effect is an erosion of political control of public policy, on the mistaken view that program effectiveness evaluation is an established, viable audit technique which provides value-free data for consumption by policy makers. Strategically, the Auditor General has only to insist that a particular program is an appropriate candidate for review. The task of conducting the review - or of seeming to quibble about the program's suitability for evaluation - falls to the bureaucracy and the Government. The Auditor General can then judge the quality of the evaluation. The Auditor General thereby has become a powerful political actor by virtue of a vastly reinforced ability to suggest subjects for parliamentary consideration - i.e., to direct Parliamentary enquiry to policy themes and issues of his own choosing. Should the Government use its control of Parliament to stifle these themes, the Auditor General has only to move to the media and the public. Parliament is thus a weapon in the Auditor General's hand when he so chooses, rather than the other way about. Indeed, the Auditor General is a far more powerful opposition than the Official Opposition. He claims what he wishes to claim, and is not himself subject to exposure and examination. The government must comply with his demands and suffer his accusations in silence, or appear to be self-serving. As a recent commentator notes, without irony, "Few if any governments anywhere in the world are subject to such accountability." The Auditor General

...sees the hypothetical danger of an auditor general abusing his power as more than outweighed by the benefits which value-for-money auditing will bestow on Canadian taxpayers. No longer will politicians or bureaucrats be

able to ignore, camouflage or suppress the true effects of their spending programs, no matter how ill-conceived or ill-fated they may be. From now on they will either provide Parliament with a factual comparison of the original objectives and actual results of such programs, or risk having their failure to do so exposed in the Auditor General's report.¹⁴

It is essential to answer that Governments do not attain their legitimacy by being substantively successful in all their attempts at governing, as judged by the bottom lines of auditors - even progressive auditors. The legitimacy of Government is based on the electorally-expressed will of a sovereign people. The electorate puts politicians in power to pursue policy via programs, watched but not seriously impeded by the vigilance of other politicians. The Auditor General has brought management information into Parliament, but presents it as a finished product, a spectacle for Parliamentarians that is already completely valenced.

Opportunity Costs of Present Situation

It being the case that the problem is preponderantly political, it is enough to say briefly why program evaluation is not the kind of activity which it is claimed to be, and to enumerate the opportunity costs for government in allowing the present situation to unfold. An outline is then presented of a process which would be less harmful, and possibly of some benefit.

Let us sketch political opportunity costs first. The argument is that program evaluation research is biased toward producing very poor quality studies and, concomitantly, negative results. There is some circumstantial evidence that the OCG has attempted to de-fuse the effect of evaluation activity, by locating it at very low levels of organization.¹⁵ But his office's working definition of what evaluation entails is mandated by the needs of the Auditor General. This need is for a routinized and demonstrably objective technique to locate any existing links between programs as causes and social conditions as effects. The program itself is conceived of as a repeatable intervention into a state of affairs in order to bring about controlled, orderly change. Failures must be clearly documented so that politicians can be advised to try an alternative program strategy to bring their policy into effect. Having exhausted all program possibilities, logic dictates that they abandon their policy as unworkable. Beginning this task in seeming good faith, the OCG in 1979 conducted a review to establish which areas of the expenditure base of government are most "amenable" to evaluation. It now appears that a total of a couple of hundred million dollars will be spent over the next few years in the first phase of a cyclical review of the effectiveness of programs in the amenable base.¹⁶

But program evaluation, as just one type of applied social research, is beset by difficulties.¹⁷

- difficulties about specifying goals - it may be counter productive or inappropriate (e.g. for political reasons) to specify them, they may not be representable with even rough accuracy by simple indicators which in the case of multiple goals will be incommensurable, and the goals may properly change or be changed in the course of carrying out the program
- difficulties from lack of knowledge about social causation and hence lack of theory to focus the evaluation research (leaving the symbolic political rhetoric as a broad guide to suggest mechanisms for test...)
- difficulties about replicating programs, and thereby carrying over to one program lessons learned from an earlier program (and related difficulties due to ever-changing contexts of program application)
- difficulties about organizing and maintaining in a bureaucracy or a political system a "memory" for any lessons at all
- difficulties about using the results of one-shot studies when these results are not overwhelmingly confirmed by ordinary knowledge or "common sense", or by other research

These difficulties have been fully experienced in the United States, where they have been brought out into the open by the public character of evaluation activity. This public character has ensured that the "normal" control processes of science could operate - the critical scrutiny of studies by large numbers of independent but interested "expert" individuals. The calibre of the bulk of the work has been documented as being appallingly low.¹⁸ Generally, the null hypothesis is tested: in program evaluation it is that the causal intervention of the program has made no difference to the state of the problem as currently described. The internal logic of scientific research is that its own errors and inadequacies work in a conservative direction to weaken "findings" and stop the researcher from overturning the null hypothesis. The foregone conclusion of sloppy research is therefore that "nothing works" whether or not this is the case.¹⁹ This is of course a safeguard in "pure" positivist scientific method. It is however, no way to come to grips with social policy. The few higher quality studies whose findings have been surprising and/or of political relevance - the Coleman report, the studies on Headstart, the notorious Moynihan Report, and the Guaranteed Annual Income experiments for examples²⁰ - have spurred whole research traditions and bitter partisan controversy rather than decisive, successful, "technical" intervention. Further, there is considerable evidence that evaluation activity results in a major expansion of government. In the U.S. program evaluation conducted in the executive alone - not counting congressionally mandated activity - was

already in 1977 a multi-million dollar industry. In Canada, where we have entered into an open-ended commitment to control, we will see many of the true costs hidden because departments are currently expected to subsume the activity under administrative overhead (ironically making them look less efficient than they are).

In summary, we have a control mechanism whose default value is that the program is ineffective. This is coupled with increased demands for bureaucratic in-house expertise for both conducting and monitoring the evaluation studies. The net effect can be predicted to be small government coupled with big bureaucracy. Less will be delivered to the public, and more will be spent on organizing the internal research to document the intractability of the public's problems.

It is not completely parenthetical to put some political clothing on this opportunity cost. There is some evidence that the present Auditor General of Canada is not unaware of what he has accomplished and what further can be accomplished through the use of program evaluation. He is in fact no closet ideologist, but has gone on public record with his views. One notable example is a speech he presented to the annual conference of the Institute of Public Administration held in August 1979, in Winnipeg.²¹ It is a passionate polemic for small government, in which the authorities are the economists Milton Friedman and F.A. Hayek. It caricatures bureaucrats as fanatic spenders of money which they regard as "wampum". This argument is supported by reference to the New York Times on the American bureaucracy; similarly he sees the cure in the American "tax revolt" of Proposition Thirteen. He calls personal income tax deduction at source "...this insidious and monstrous bureaucratic strategem" recommending that citizens should pay personal income tax in cash at year end, presumably to maximize and concentrate feelings of resentment. In one breath he maintains that he is apolitical. In the next he speaks approvingly of "right wing" governments in Britain and elsewhere, including the Canadian provinces, perhaps misapprehending that "right" merely stands for "correct" in the phrase. In this speech he also maintains that his new "comprehensive audit" does for non-profit organizations what the "bottom line" does for business - i.e., it establishes one simple measure of viability derived from some form of cost-benefit analysis. In a word, the Auditor General is rounding out his American decade with a florid case of the Neo-Conservative flu: belief in market forces paradoxically matched by belief in stringent conservatively-motivated fiscal restraint which he sells as rational planning.

Another central opportunity cost is that the bulk of the money and talent spent on evaluation research will be wasted. The terms of reference for the individual research projects will be truly political treaties drawn up between the armies of the Auditor General and the departments, guaranteed by the Office of the Comptroller General. Any relevance to researchable questions will be purely accidental. Parenthetically, social science type activities will be further discredited, perhaps with the effect of turning a

generation of bureaucrats against systematic observation and ⁴³⁶investigation.

How Government Might Direct Applied Research

This is a natural point to turn toward recommendations for a better policy. The gist of my argument is that a little decent specialization is a helpful organizational device: let the auditors audit; the accountants count; the trained social scientists conduct analyses, evaluations and experiments; and the politicians take major responsibility for the ideological and value choices to be taken in setting priorities.

Likewise, a plan for developing a procedure which would use the methods of social science to good effect should involve sorting problems, to match them with the appropriate treatment strategies. There is no possibility that a system can be devised to crack all the hard problems overnight. But a start can be made toward improving the quality of applied study mandated by government. At least part of what is necessary is to distinguish areas where "technology" exists and could clearly be mustered in different ways to serve different ends, from areas where we make only inadequate attempts to apply knowledge in the name of our values, from a third area in which our values are all we have.

I cannot pretend to do anything more than suggest the barest outline for establishing a procedure which would sort problems. First, it would be necessary to set up a centrally-directed government body. It might be staffed with academics representing many substantive fields of social science, experts in methods of investigation, and experienced policy analysts, or it could instead have a small core of staff with access to such individuals on a part-time basis. Earlier, I suggested that the institution which might attempt the tasks I will propose should be free of political entanglements. Readers' comments have convinced me that my earlier discussion of the difficulty involved in obtaining disinterested objectivity in social research would hold also for this new body. Therefore, I now propose that it should report to a government minister, and be openly responsive to political needs as well as to its internally established priorities. What will the institution do? It will take responsibility for sorting the government's applied research projects, making sure that applied research is conducted first in the most rewarding areas. As noted earlier, the Comptroller General has a project in hand which in itself is a beginning. His Task Force on Program Evaluability has examined the expenditure base of the 20 largest spending departments, and has broken these departments' activities down into units most suitable for evaluation and assessment in general. The "sorting institution" could take the Comptroller's department-by-department list of program components of government's expenditure base, and review the list to isolate problem areas. It would assess the descriptions of the "program

components" to select those whose success, when phrased in terms of goal-seeking behaviour, will depend either upon discovery of causal links or upon contested "knowledge" of such links, i.e., it would separate "management" topics from research topics. As I have argued earlier, many programs require or assume knowledge of causes which does not exist. Programs in the areas of addiction, insanity, criminality and social welfare are prime examples.

The sorting institution could then compute sub-totals for the amount of current government expenditure on such "problem" activities for a number of broad areas. The sub-totals would reveal the current social value of ameliorating and/or managing currently unsolvable problems, through the expenditure budget. This is government's "bottom line" for how much concern it shows for the problem.

The sorting institution, having given problems an "importance rank" could then turn to questions of giving the problems priorities for research in terms of feasibility and/or existence of some consensus within the social science community with regard to the problem. The list itself would be made public, and the community of ideologically-opposed experts and non-experts alike should be encouraged to contribute to the debate, although the government list would be sufficient to start activity. There are probably very few areas where agreement could be reached as to the "real" goals of programs and their appropriate indicators. That is, one man's social problem is another man's inadequate redistributive arrangement. But there would be some areas of agreement: the House of Commons' Committee on Justice and Legal Affairs managed to bury partisan and value differences and produce a distinguished and constructive evaluative report, as an example.²²

Having selected even so much as one area, attention could then be turned to assessment of current practice, and available knowledge. The sorting institution would then send out public requests for proposals for individual projects of applied research, and for whole programmes of research into the broader area. It would, of course, be necessary to set up proper procedures of peer review of proposals, for control of projects' methodology and for review and dissemination of findings. Consultancy firms, academics and established government policy groups could compete for the contracts on an equal footing. Peer review of proposals could be conducted on a number of models. Award criteria would be made public. More than one study would of course be selected for each area, and approaches would be controlled and planned on an experimental basis. All reports and findings would be properly catalogued and stored after publication. This might involve only tabling in the House at the same time as they are released to the Auditor General. Knowledge of both success and failure would cumulate as a resource for the policy community.

It cannot be over-emphasized that the sorting institution should concern itself with applied social research for which government is the client. It should not become a source of funding for basic "academic" social research. It would assume responsibility for mandating program evaluation studies from the Office of the Comptroller General. Its founding legislation might explicitly state

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that this body would decide, authoritatively, when it would be "appropriate and reasonable" to evaluate a program, and the content of "satisfactory procedures". The Auditor General's "value for money" audit would thus become a paper power, without the need for direct and clear challenge to the Office. These offices would concern themselves only with probity and financial control in the problem areas. The sorting institution's relationship to similar departmental bodies which commission research in their various policy areas would have to be worked out: presumably these agencies would be willing to be co-ordinated and orchestrated.

The sorting body would also have a number of "background tasks". It could be expected to review the adequacy of current statistical series serving as background information to problem areas, and to recommend feasible improvements and additions to Statistics Canada series. It could produce and commission papers documenting historical definitional changes made to official data series, to make them more accessible to non-government researchers. Work could be done on designing storage and retrieval systems to function as government's memory for the results of its own research. The sorting institution might also take responsibility for keeping track of cumulative research results for some areas as suggested by David Braybrooke:

...to some extent, of course, this is already done, in papers reviewing current work on specific topics; but in most branches of PSI (professional social inquiry), if not in all, such papers appear irregularly, without any co-ordinated attention to gaps in coverage. I expect that most people engaged in PSI (professional social inquiry) could not say how things currently stood, in respect to surviving generalizations, cumulative results, and most promising lines of investigation, in any branch outside their specialties... Suppose there were a number of competent committees set up to produce regular, highly visible Reports on Cumulative Results - some on topics divided according to academic (theoretical) interests; others on topics divided according to the public issues to which they applied. Would not the impression of divergence be much reduced, after perhaps only a very short time? Might not the fact of divergence be reduced, too, as people engaged in PSI aligned their researches with the Reports, dropping some topics and taking up others now that they had a better idea of where things fit in?²³

The hardest part of the problem remains of course. The arrangement described above would work from the bottom up. It would be completely stymied only as it ran into value problems which are actively perceived by the community as being value problems, at the same time as it ran out of work, which should take some time. Clearly something must be done to improve the quality of discussion from the point of starting with values and choices. Someone will reply that this is the task of the politicians, to be realized in automatic fashion in the political marketplace. But political actors are usually too busy to sort problems. Nor is the political marketplace of much help:

Markets only provide mechanisms for co-ordinating individual preferences once those preferences have been formulated and expressed in acts of consumption. The market, therefore, is of no help to us in those areas of life where we have to decide what our patterns of consumption are to be, how our preferences are to be ranked, how our desires are to be ordered...

There are weaknesses and defects in our system of political decision-making that correspond precisely to the weaknesses and defects of the market. It, like the market, is responsive to the pressures of the present much more rationally than to those of the future, partly because our ability to predict the future accurately is in general extraordinarily limited. And it, like the market, is far more effective at expressing already formulated choices on familiar issues than at formulating new possibilities for choice in unfamiliar areas....And if public discussion that will enable ordinary citizens to formulate and express radically new choices does not take place, then the political and economic outcomes will inevitably be sadly defective.²⁴

Political ideologies once presented sets of ideas which seemed coherent, if only because the ideas familiarly went together. At the moment, however, we cannot rest on even the small coherencies of habit: virtually nothing hangs together to present convincing sets of alternatives. The Canadian public is particularly poorly served by its intellectuals and academics with regard to this matter of formulating new choices: events and institutions are too-seldom demystified by coherent analyses which are made accessible. This might be a reason to spare a few crumbs from the board spread for "scientific" social science to fund "unscientific" studies of these same problems. Intuitive, impressionistic, moralistic, essayistic brands of scholarship could complement and enrich the behaviouralist, systematic, quantitative scientific orientations²⁵ which develop technological knowledge for manipulating our environments. Additional higher-level analysis of the interaction between relevant values, operating principles and program outcomes would also be valuable.²⁶ This brings us to the one considerable benefit, not yet noted, of the sorting institution's political headship. This is that the arrangement enables an amending of policy: data generated by institutionally-mandated research are used as a correction to the theory/policy which had initially guided the research. With an independent body, this organic process of science would be disjoint into "factual" and "valuing" phases. The one considerable disadvantage is that the non-quantitative interpretive analytic work recommended would all necessarily be from one (partisan) ideological perspective. This would not be

too serious if the hired social science help were to be changed on a Jacksonian model on regular changes of partisan government. But we nearly always elect Liberal governments. Perhaps significant funds could be made available for intellectual endeavour by opposing partisan scholars, which happens to some extent already.

I will stop now, because others will have thought much more carefully about these matters. I rest my case as follows: the government now spends a fair amount of money on applications of social science method. These studies could be provided more efficiently and effectively under virtually any set of rules other than the ones in place. Further, they are currently provided in a way that poses a considerable threat to the integrity of our political system. This should be stopped because we value the public's right to be represented in areas where values are obviously acted upon.

1. Richard R. Nelson, The Moon and the Ghetto (New York: Norton, 1977). The author discusses three intellectual traditions concerning the allocation problem. One focusses on politics and the policy-making process, the second on changes within the institutional structure, and the third on modes of re-allocation of scientific and technological talent, to generate solutions without reallocation. All three traditions, he says, "have tended to exaggerate the extent to which problems are technical, and the correct answers a matter of professional judgement and calculation." p. 18
2. "Studying Policy Outcomes for Government", paper prepared for the Conference on Strategic Research Funding Priorities in the Domain of Science, Technology and Human Values, held November 16-19 at St. Mary's, Ontario.
3. Mr. Douglas Newson, User Advisory Services, Statistics Canada, supplied the figure in a talk to the School of Public Administration, Carleton University, September 27, 1979.
4. See, for example, Albert D. Biderman, "Social Indicators and Goals," in Raymond A. Bauer (ed.) Social Indicators (Cambridge Mass.: M.I.T. Press, 1966), pp. 68-154. For discussion of the American situation, see Harvey Brooks, "The Federal Government and the Autonomy of Scholarship," in Charles Franke (ed.), Controversies and Decisions: The Social Sciences and Public Policy, New York: Russell Sage, 1976.
5. See Stephen Clarkson, "Socking it to the Scholars: The First National Conference of the Social Science Research Council of Canada," Queen's Quarterly, 83, 4 (Winter 1976), pp. 547-554.
6. For a very useful discussion, see Michael J. Prince, "Policy Advisory Groups in Government Departments," in G. Bruce Doern and Peter Aucoin, Public Policy in Canada (Toronto: Macmillan, 1979), pp. 275-300. Prince discusses a Treasury Board study of planning and evaluation activity conducted in 1974. It is often argued that none of this was taken seriously as "science", but was only a paper exercise to fulfill the forms required in PPB.
7. It is difficult to arrive at hard figures for loss in the ES group because it is often positions which are cut, rather than actual persons. The ES members re-describe themselves and move elsewhere on priority.
8. See, for detail, Auditor General of Canada, Conspectus of the 100th Annual Report to the House of Commons (Ottawa: Supply and Services, 1978), Appendix A, "Comprehensive Auditing for Parliament: A New Cyclical Approach," pp. 77-96.
9. Ibid, p. 3. See also, 100th Annual Report of the Auditor General of Canada to the House of Commons (Ottawa: Supply and Services, 1978) p. 5.

10. The Auditor General Act, 7.(2) (d) and (e). For the full text of the Act, see the 1978 Report, Appendix A, pp. 585-589.
11. See, for evidence of this wish to cure, Report of the Auditor General of Canada to the House of Commons for the Fiscal Year 1973, (Ottawa: Supply and Services, 1973), p. 5.

...While I shall report to the House of Commons on such matters as required by section 61 of the Financial Administration Act I intend to report also on the action taken to remedy detected weaknesses. I further intend to have the revised procedure monitored for an appropriate period to ensure that the remedial action is, in fact, achieving the desired results.

In the 1974 Report, the Auditor General re-states the same message, noting that section 58 of the Financial Administration Act suggests the Auditor General should review rules and procedures. Later on, this is more firmly claimed as a requirement, justifying the service-wide study of financial management and controls. See also Sonja Sinclair, Cordial but not Cosy (Toronto: McClelland and Stewart, 1979), p. 111. The Sinclair book virtually qualifies as an official OAG publication. The Office bought up 1,500 copies from the publisher for about \$22,500 (\$19.95 each in bookstores) and distributed them to all staff, provincial auditors and some accounting firms. See Frank Howard's Bureaucrats, The Citizen, Ottawa, Thursday, September 6, 1979, p. 2. One wonders what value the public received from this largesse.

12. One is led to this view by the Report of the Independent Review Committee on the Office of the Auditor General of Canada (Ottawa: Information Canada, 1975). "Independent" is part of the name of the committee: the Auditor General himself appointed its members. The report explicitly links the need for major qualitative changes in the audit function to the "new approach to expenditure management" of the 1960's (i.e. the adoption of PPBS and the decentralization of financial control following upon the Glassco Commission's report). PPB was intended to make analysis (both political and bureaucratic) guide internal bureaucratic procedures by linking the products of analysis to the budgetary process. The Independent Committee Report provides a succinct description:

In developing requests for future funding, departments were supposed to examine critically their current spending programs, to evaluate the effectiveness of past expenditures and to analyze the comparative cost and effectiveness of alternative methods for achieving objectives. Interest was promoted in cost-benefit analysis and other quantitative techniques designed

to promote superior evaluation of expenditure proposals. ...old techniques of detailed control were found to be inefficient and PPBS represented a major effort to respond to the problem...these changes reflected a recognition that in a multi-million dollar budget it was less important to ensure that every financial t was crossed and i dotted than it was to know whether funds were being spent in a manner that would ensure the achievement of the purposes for which they were made available. (p. 23) 443

13. Sinclair, op. cit., p. 175. Undocumented expenditures in the millions had been made. Despite the important factors 1) that Parliament has never controlled the "public purse" in the sense suggested, 2) that the abuses took place in loosely controlled, entrepreneurial crown corporations rather than in the ministries of government, and 3) that the abuses had to do with the ruthless pursuit of the bottom-line of profit rather than with experimental or over-ambitious social programs, the Auditor General acquired fully-negotiable currency.
14. Ibid., pps. 175 and 125.
15. See Harry G. Rogers, "Program Evaluation in the Federal Government," in G. Bruce Doern and Allan Maslove (eds.) The Public Evaluation of Government Spending (Toronto: Institute for Research in Public Policy, 1979), pp. 79-89. Two other readily-accessible windows on the Comptroller's thinking are his "Management Control in the Public Service", Optimum 9, 3 (1978) pp. 14-28, and "Management Perspectives: From the Office of the Comptroller General of Canada", in Comprehensive Auditing - Planning for Century II: Centennial Conference Proceedings Office of the Auditor General of Canada (Ottawa: Minister of Supply and Services, December 1978), pp. 65-68. See also Harry G. Rogers, "Program Evaluation and its Role in Management of the Federal Public Service", Management Consulting Institute Bulletin, No. 9, May 1979. n.p.
16. The only cost information readily available for conduct of effectiveness evaluations in Canada is that found in the Auditor General's 1978 Report. An educated but conservative guestimate based on this information puts the cost of each SPICE study at about 77,000 dollars. The estimate is low because Macdonell and senior staff contributed their time generously on a noncosted basis. Further, of the projects which were not completed on time for the 1978 report, the majority were effectiveness evaluations. Thus one can deduce that the effectiveness evaluations required more time and resources than the average study of economy or efficiency, hence cost more than the average 77,000. Departmental evaluation managers estimate that it costs about \$30,000 to hire consultants to conduct an assessment for evaluation, with the actual study costing several times more. See also Richard

E. Brown (ed.) The Effectiveness of Legislative Program Review. (New Brunswick, New Jersey: Transaction Books, 1979), pp. 142-143. The book contains a number of case studies of major evaluations conducted by state auditors for their legislatures, and a review of outcomes.

About a third of government's estimated (by Mr. Rogers) 2200 "program components" are thought to be evaluable. Thus one can cost one-third of the base for both feasibility and full-scale studies, and add some portion of the cost for running both Offices.

17. My earlier, longer paper discusses these difficulties in detail. It can be made available on request. Some detail, as well as supporting references to the evaluation literature, can be found in a recent paper by me and J.M. Jordan, "Assessing the Results of Public Expenditure: Program Evaluation in the Canadian Federal Government", Canadian Public Administration, 22, no. 4 (Winter 1979) pp. 581-609. In summarizing these difficulties, here, I have preferred David Braybrooke's version of what I said, in a talk he presented to the Hastings Centre last November.
18. Of great value is the census of evaluation activity of the U.S. Federal Government in 1974, reported in Ilene N. Bernstein and Howard E. Freeman, Academic and Entrepreneurial Research: The Consequences of Diversity in Federal Evaluation Studies. (New York: Russell Sage, 1975). See also Gerald Gordon and Edward V. Morse, "Evaluation Research", Annual Review of Sociology, 1, 1975, pp. 339-359. Also useful is Anne L. Schneider and Peter R. Schneider, "Evaluations and Decision-Makers: Perceptions of the Evaluation Process". Contract report from the Law and Justice Planning Office, Washington, and the Law Enforcement Assistance Administration, January, 1977.
19. See Robert Martinson, "What Works - Questions and Answers about Prison Reform", Journal of Public Interest 6, (June, 1974), pp. 22-54. Useful discussions are also contained in Laurence Lynn, "Policy Relevant Social Research: What Does it Look Like?" and Richard A. Berk and Peter H. Rossi, "Doing Good or Worse: Evaluation Research Political Re-examined", in Marcia Guttentag and Shalom Saar (eds.), Evaluation Studies Review Annual, Vol. 2 (Beverly Hills, Sage: 1977), pp. 63-79 and 77-90 respectively. The Berk and Rossi piece is the franker.
20. For an up-to-date bibliography dealing with this research, see Charles E. Lindblom and David K. Cohen, Usable Knowledge: Social Science and Social Problem Solving. New Haven: Yale University Press, 1979. Specific discussions of these studies are to be found in Charles Frankel (ed.) Controversies and Decisions: The Social Sciences and Public Policy. New York: Russell Sage, 1976, and in Irving Louis Horowitz and James Everett Katz, Social Science and Public Policy in the United States. New York: Praeger, 1975. For a unique historical discussion of a major Canadian attempt at analysis and research for decisive reform, see Rick Van Loon, "Reforming Welfare

- in Canada", Public Policy, 27, no. 4 (Fall 1979) pp. 469-504.
21. See James J. Macdonell, "Value for Money: The Accountability Equation", a paper presented to the annual conference of the Institute of Public Administration of Canada, Winnipeg, August 29, 1979. This is an amazing piece to have on public record. Mr. Macdonell ensured that the bureaucracy would be aware of his views by saturating government departments with gift copies of this speech.
 22. The Sub-Committee on the Penitentiary System in Canada, Standing Committee on Justice and Legal Affairs Report to Parliament, Second Session of the Thirtieth Parliament 1976-77 (Ottawa: Minister of Supply and Services Canada 1977). The report is popularly known as the MacGuigan report, after its chairman Mark MacGuigan. Vice-chairman was Yvon Pinard.
 23. David Braybrooke, "Reflections on a Paper by S.L. Sutherland, 'Studying Policy Outcomes for Government', and a book by C.E. Lindblom and D.K. Cohen, Usable Knowledge, prepared for a conference on "Ethics and Public Policy: Social Inquiry", at the Hastings Centre, Institute of Society, Ethics and the Life Sciences, Hastings-on-Hudson, N.Y. 30 November/ 1 December 1979, pp. 5-6.
 24. Alasdair MacIntyre, "Power Industry Morality", in A Report from the Edison Electric Institute Symposium on Science, Technology and the Human Prospect, New York Review of Books (Advertising Supplement) n.d., distributed 1979.
 25. The opposing descriptions are those of Albert D. Biderman, in his review of a collection of books reporting on American uses of social science for policy-making: "Self Portrayal", Science, 160, (September 1970) p. 1065. While he doesn't recommend essayistic scholarship, he does suggest that the social sciences could be more useful if more interdisciplinary work were done.
 26. Martin Rein, Social Science: Public Policy. Penguin, 1976, provides very provocative discussion of the need to integrate values into the analysis process.

Commentary on Sutherland Paper

This is an interesting paper which makes the reader sit up and take notice. Certainly, the prospect of "management control" by accountants in social science "drag" is not an auspicious prospect for sound policy making in government. While reading the paper, I kept wondering if the author was over-representing the developing power of the auditor-general's office and thereby creating a straw-man which could easily be ripped apart by those sensitive to the merits of social science approaches to policy. Again, while reading the paper, I awaited some condemnation of previous social science applications which have deserved to be known as bankrupt of insight and scarcely worth the time and money of those government agencies which commissioned these studies.

My comments rest upon two convictions relevant to the subject matter of this paper. 1) The quantification techniques of social science which were so eagerly grasped by governmental agencies followed American positivistic sociology, in many cases, did little to add to the kind of knowledge needed for policy evaluation. Indeed, these techniques may have prepared the way for "management studies" of the type Sutherland is now speaking to in her article. 2) The tendency for business to appropriate social science concepts is a cultural phenomenon which is being experienced in the board room as well as the classroom. In fact, commerce faculties are now teaching their own brand of social science under the rubrics of marketing, management and economics. The characteristic feature of these new commerce courses is their simplistic approach to social science, in favor of what Sutherland terms "bottom line analysis". Incidentally, the very term recalls its use in the Watergate tapes and, by implication, carries with it the ends-justify-the-means logic.

The author's sensitivity to the two points I raise above is reflected in her paper. To develop my point further let me cite the present situation within Newfoundland. The DREE policy of resettlement was supported initially by a modicum of social science research and was subsequently widely debated within social science. The cultural effect of resettlement is still to be studied. The new experience of arrogance in Newfoundland and the revival of the arts (indeed, the appearance of arts) could be seen in relation to the attempted cultural genocide inherent in DREE's socio-economic policy of resettlement. Government has to be cognizant of even the unintended consequences of social policies and it has been the peculiar feature of social science, when it is practiced in its best tradition, that it can cope with the intangibles which are caught in social acts. It does so precisely because of its skepticism in discussing the components of human action. The history of social science is the history of dealing with variables. To relegate this experience to the dustbin of X factors would mean that we would know less about the initiation, implementation and consequences of public policy, not more. The history of resettlement in Newfoundland has contained within it an alternate history of social science development. Macro economic theory applied to Newfoundland was filtered through the experience of outport life, resettlement in urban centers, and through the experience of social scientists

observing these changes. The debate which ensued was between cost/benefit advocates and cultural advocates. Today, because of the level of this debate, with oil possible offshore a major question being raised is a social question: How will Newfoundlanders be affected? The level of consensus reached in Newfoundland is beyond that achieved in Nova Scotia.

The background for Newfoundlanders recent optimism and former despair is the history of contradiction of policy in the Canadian state. The same state creates policies for central development and regional underdevelopment. It also appeases the regions. Whoever can grasp these contradictions can advise the policy makers. Sutherland's concept of a social science group as a "sorting institution" seems a great deal more equipped to do so than the management accountants. The latter would have had a difficult time with the regional disparity question -- up to now, and until oil is discovered, this region has been a dead loss, managerially speaking. Can the auditor general's methods account for the fact that our loss is not Canada's gain?

WORKING AT THE LIMITS

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It is refreshing perhaps, if not altogether reassuring in these days of the Ayatollah, to be told that there is possible "a critique of preferences, which would rectify them by appeals to knowledge," (Braybrooke, p.2). This at least leaves open the possibility of reflection in a way that the operant calculus described by Brusegard does not. Social indicators research leaves implicit and unexamined (as by definition it must) the linkage between objective, observable measures and subjective satisfactions. How we may hope to achieve a "more rational decision procedure in public policy" if the basis of that rationality is to remain undisclosed is a problem which, properly, threatens the authority of the movement. But Braybrooke does offer "critique" not "calculus" and leaves room for reflection within the field.

Does he, however, leave room enough? The limits we prescribe for reason are drawing tighter and tighter. The naively positivist assumptions of the recent Proposed Five-Year Plan for the Social Sciences and Humanities Research Council (June, 1979 - for comment see Gordon Treash in the Nov., '79 Humanities Assn. of Canada Newsletter) afford pertinent evidence that the nature and authority of reason are growing increasingly fragile. In part this is because we are uncertain of reason's claims as we suffer the pressures of our rapidly accelerating history. To some extent Braybrooke is right that the way to meet this panic is to secure the castle's inner keep by filling in the fields already delimited. But he is only half right. Insecurity within the boundaries of the disciplines we have rationally established is compounded by our daily experiences of the irrational and the anti-rational, globally or locally. The gentle and humane discourse of liberal utility will not rectify that which defies rectification.

Braybrooke is undoubtedly right in reminding the S.S.H.R.C. that it should take its cue from "What productive people...choose on their own initiative to do next." But there is a danger unless we define "productive". Production in this area is properly to be seen as a pushing forward in method and language particularly. The limits of both method and language have to be experienced since we are, as Gail Stewart tells us, increasingly being challenged to work beyond those limits. What must be avoided is undue encouragement to those productive scholars who, through cynicism or fatigue or innocence, insist on filling in rather than extending the territory enclosed. We need to create more room for our experience of reason and for rational reflection.

Professor Guédon would seem to hold that such experience is a good deal less important in the whole enterprise than the simple recognition that science is an activity, one that carries rewards, and that we must ensure that "the benefits accruing from scientific and technical activities are distributed in a more equitable way than is the case at present". From Guédon's perspective too Braybrooke's critique does not leave enough room. Guédon's kind of reflection however, is really a deliberation on how to attain power and achieve a voice.

The tension between rectification and power and human rational experience centres on the question of limits, principally limits of method and of language. Braybrooke appeals to a rational experience of knowledge as an adequate basis for communicating, for consensus, for an inventory of needs, for compromise, etc. But, more and more, we are encountering the problem that we must work outside these limits. On the other hand not all would want to redefine reason, as Guédon appears to want to do, exclusively as an exercise of power. We are left with the questions - how do we work at or beyond the limits of our disciplines without resorting to violence in its various forms? Are there options? Does the S.S.H.R.C. bear responsibility for clarifying these options and making them available to us if they exist, or of warning us if they do not?

The problem of limits is manifest in the utilitarian assumptions. Braybrooke speaks of needs. "It is possible" he says (p.3) "...though not entirely easy, to state a list of basic needs, physical and social, that almost everyone will agree are to be ascribed to human beings with presumptive universality. Moreover, this basic list makes much more significant claims on resources than is commonly allowed...the need to preserve the body intact has, for example, very expensive implications for industrial safety."

But is it valid, in fact, to speak of universality even in so basic a matter as the preservation of the body intact? I overheard, just the other day, a conversation at a drugstore dispensary counter. Two customers were discussing their recent surgery, one for a hysterectomy and the other for a partial gastrectomy. I was struck by the utterly casual and matter-of-fact way in which they discussed their experiences. Their flat dispassionate reminiscences might have been mistaken for courage or for shock. It soon became obvious that it was neither. It was a profound indifference worthy of Becket. Needs, to be recognized as such, have to be experienced as needs.

So where are we and the S.S.H.R.C. left? If Braybrooke's license for rational reflection is too restrictive, so too is Guédon's. The situation requires a broader field for the intellect to occupy in our lives. This field will be occupied as we come increasingly to see that scholarship and research are two quite distinct though complementary acts. They are not two words for the same thing. We need research, in both Braybrooke's and Guédon's different senses, to secure the castle keep. But we urgently need scholarship to afford, as its etymology suggests, that genuinely free experience of the opportunities our humanity continues to disclose. Most urgently perhaps we need to develop a deeper and more precise notion of what this scholarship is and what it must still become.

THE HUMAN CONTEXT FOR SCIENCE AND TECHNOLOGY:
COMMENTS ON RESEARCH PRIORITIES FROM AN EDUCATIONAL PERSPECTIVE

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The following comments are intended to contribute to the ongoing discussion of research priorities in the domain entitled "The Human Context for Science and Technology" by adopting the perspective of education. The human context in which science and technology must exist is shaped in part through the operation of educational activities. In what follow, a critical look at one aspect of these activities provides the basis for arguing for the importance of two areas for further research.

Knowledge Creation, Application, and Transmission

Talk about science and technology focuses attention on two important activities, the creation and application of knowledge. Talk about education focuses attention on a no less important activity, the transmission of knowledge from one generation to the next. The essence of this triadic relationship is embodied concretely in the university, where the activities of teaching, research, and development are inseparable both in practice and in principle.

In the case of the science disciplines, this special relationship between the creation and application of knowledge, on the one hand, and its transmission on the other, has itself been the object of study. Ziman, in his Public Knowledge: The Social Dimension of Science (1968), points out the significance of the two-way relationship between research and teaching. According to him, teaching does more than expose the student to the "frontier" of research. "The act of teaching is not merely passive; as knowledge is expounded, it becomes more orderly, formalized, and refined" (p. 76).

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This two-way interaction -- between a teacher's teaching and a student's learning a piece of knowledge and the knowledge itself -- operates, moreover, at more than one level. Ziman's reference is to what is explicitly taught, the very physics and chemistry of university courses, for example. But when students study science, they learn more than the scientific knowledge explicitly taught to them. They may, for example, develop the skills of precise observation and measurement; they may acquire an implicit appreciation of the scope and limitations of science; or they may develop an implicit understanding of how scientific knowledge is applied in the context of, say, medicine or engineering. But the by-products of science teaching may also be less desirable. Students may come to believe that science represents an accumulation of true facts about the world, that scientists are inhumane and not to be trusted, or that scientific knowledge can resolve all of society's problems (or, at the other extreme, that it is irrelevant to them).

Clearly, if these implicit beliefs are firmly enough rooted in an individual's mind, they can have a profound influence on the way he thinks and acts. Indeed, they may turn out to be more influential than the scientific knowledge explicitly taught and learned. In fact, it is often the case that such beliefs and attitudes are retained long after the knowledge explicitly learned has been forgotten. But, even in the case of those having a sophisticated level of scientific education, the implicit knowledge associated with this sophistication can sometimes be remarkably naive. The problem is not so much one of "what is known" but "how that knowledge is 'held'."

Now, the roots of this "epistemological naivete" can often be traced back to the education in science provided to students in school and university. Evidence for this has accumulated in research conducted at the University of Toronto (OISE) over the last ten years or so, which has shown how a variety of different understandings about science can originate in school textbooks, classroom discourse, and teacher education materials.

(Selections from this line of research are reported in a forthcoming volume, Seeing Curriculum in a New Light: Essays from Science Education, edited by Munby, Orpwood, and Russell.) Further inquiry on a large scale into the types of learning that can result from contemporary science education in Canada is underway as part of a study being conducted by the Science Council of Canada.

The potential dangers of such naivete, whether in (otherwise) sophisticated scientists, in persons having positions of leadership and responsibility, or in members of the public more generally cannot be underestimated. Accordingly, the second part of these comments attends to the possibilities for change and to the corresponding needs for research.

Towards Epistemological Sophistication

One of the concerns in the domain under consideration is the management, evaluation, and control of science and technology. Now, clearly, the quality of the management, evaluation, and control of any enterprise depends

in large part on the degree to which the enterprise is fully understood. This understanding becomes a particularly complicated educational goal when (a) the enterprise is based on highly complex and technical forms of knowledge such as the natural sciences, and (b) the enterprise is publically owned and thus publically accountable, such as many of the "applied fields" under present consideration (e.g. health, energy, communication, etc.). Three types of persons, each requiring a different kind of understanding, may be distinguished: Scientists and technologists especially those having major policymaking responsibilities; Politicians and others who, though not having a scientific background, nevertheless have leadership or policymaking responsibilities; Members of the public at large whose support or pressure can be influential.

Those whose direct responsibility includes the leadership and direction of science/technology-related operations have a particular and special need for a sophisticated understanding of the complex relationships between their scientific knowledge, its technological applicability, and the ethical, political, and other considerations involved in its practical application and use. Some, perhaps even most, of this expertise must, at present, be acquired "on the job" because it is rarely, if ever, taught in university courses. However, the issues can be analyzed in such a way that teaching concerning them can become an integral part of university science programs. One may note, in passing, that in Britain, a project called "Science in a Social Context" (SISCON) has been working since 1973 to produce study guides for undergraduates designed to help them become more aware of the interrelationships between their subject and the social context in which it operates. In explaining the aims of the project, the authors write: "Modern society needs decision makers who can understand the social role and the social interactions of science...It seems inconceivable that either a scientist or a technologist should go through all his education and training without some serious study of these wider issues" (The Butterworths SISCON Series: An Introduction, p. 6).

Not all who take decisions or generate policy are scientists, however, and for those who occupy positions having political or administrative responsibility for science and technology, a different, though no less important, kind of understanding is needed. Such persons require an understanding of the nature of the scientific enterprise, its potential, and its limitations. They need to be aware, for example, of the sorts of claims that a scientist can and cannot make on the basis of observable evidence alone and of the ways in which competing theoretical claims are resolved in science. Out of a concern to increase this type of understanding, Conant and others at Harvard developed the Harvard Case Histories in Experimental Science.

These types of understanding would seem to be required for those who manage or assess any scientific or technological enterprise. But for enterprises in the public domain, the fact of public accountability means that the public at large must also have some awareness of the relationships between science, technology, and human values. Clearly, such a public understanding cannot be highly academic. But a public having either a misplaced faith in the power of science to solve all of the world's problems or a cynicism

that it can contribute anything to their solution is a public with a poor understanding of the nature of science. And in a democracy, even the wisest decisions of sophisticated leaders can be ineffective without a concerned and supportive public. If attention is to be given to the implicit beliefs about science held by citizens in general, then that attention must be directed at the way science is taught in school, and particularly in elementary school where nearly all students are taught science. Again, ongoing research both at OISE in Toronto and through the Science Council study is beginning to attend to some of these issues.

Research Priorities

From the foregoing discussion, areas for further research emerge as being of importance. These are not argued for in more detail here but simply listed by way of a summary conclusion to these comments.

- I. The possible and actual by-products or side effects of science teaching on beliefs and attitudes about science, technology, and human values.

As has already been indicated, work in this area has been initiated but much more is needed. What, for example, do our school science texts "teach" students about Canada, and about Canadian contributions to science and technology, about the potential role of women in science, about the relevance of science to the lives of students and their families? How is such "teaching" conveyed and learned? What is retained by students in the long term?

- II.
 - (a) The provision made by existing university programs in areas related to science and technology to enable future scientists to comprehend and deal with significant problems of a practical nature.
 - (b) The provision made by existing university programs in areas other than scientific ones to enable future leaders and policymakers to understand something of the nature of science and technology.
 - (c) The provision made by existing school programs to enable members of society at large to appreciate the nature of significant practical problems, and the potential of science/technology to contribute to their solution.

At stake in these three areas are the curricula for the three groups of individuals identified earlier. In the light of the answers to the questions raised in I, what sorts of teaching is being provided to students now, and what sorts of teaching are needed in the future? These are questions requiring deliberation by educators and others concerned for the future human context for Canadian science and technology.

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